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THE
Journal of the Society of Arts,
AND OF
THE INSTITUTIONS IN UNION.

110TH SESSION.] FRIDAY, MARCH 4, 1864. [No. 589. VOL. XII.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at 8 o'clock.

MARCH 9.—"The Science of Fish-hatching." By Frank Buckland, Esq., M.A., F.Z.S., late 2nd Life Guards. On this evening Professor Owen, F.R.S., will preside.

MARCH 16.—"On the Organisation of the Corps Impérial des Ponts et Chaussées in France." By GEORGE R. BURNELL, Esq.

MARCH 23.—Passion week. *No meeting.*

CANTOR LECTURES.

The next lecture of Mr. Burges's course will be delivered on Monday next, at eight o'clock.

MAR. 7.—LECTURE V.—*Gold and Silver.*—Antique and Mediæval plate; modern ditto (Elkington); Antique and Mediæval jewellery; modern ditto; Antique and Mediæval coinage; modern ditto.

MAR. 14.—LECTURE VI.—*Furniture.*—Mediæval furniture, oak and painted; Renaissance; 16th and 17th centuries; modern.

MAR. 21.—LECTURE VII.—The Weaver's art; Mediæval, Eastern, modern.

MALTA EXHIBITION.

The Marquis Testaferrata Olivier, the President of the Society of Arts of Malta, has informed the Council that it is intended to hold, in Malta, in April next, a general Exhibition of the Arts and Industry of the Islands of Malta and Gozo. The nobles and gentry of Malta have guaranteed the expenses, and the Government have granted the use of a magnificent Public Hall for the purpose.

SUBSTITUTES FOR GUTTA-PERCHA.

The following particulars in reference to the *Balata*, stated in last week's *Journal* to have been sent over by Sir W. Holmes from British Guiana, have been received. Sir William Holmes says:—

By the last mail I received your "Subjects for Premiums" for the session of 1863-64.

My object in addressing you is to advise, that by this packet I forward a box containing samples of *Balata* in its milky state, and also dried or coagulated. I entertain the hope that these samples fully meet the requirements of the 77th Section of your list of premiums, in reference to a substitute for india-rubber or gutta-percha, but I also trust it will be found more valuable than india-rubber or gutta-percha by themselves, possessing much of the elasticity of the one and the ductility of the other, whilst it requires a much higher temperature to melt or soften it.

After these preliminary observations, I must go somewhat into detail. I was Commissioner, representing the colony of British Guiana, at the International Exhibition of 1862. Amongst the varied contributions from the colony was a morsel of the dried milk of the bullet tree (*Sapota Mulleri-Miq*?); it weighed perhaps half a pound. Amongst the numerous individuals who visited the Guiana department was Mr. Chas. Hancock, who is well known in the gutta-percha trade. This gentleman was struck with the appearance of the specimen, and obtained a portion for experiment; he reported favourably as to its utility and value, a result most gratifying to me, as I had received adverse opinions from less experienced persons. This happened, I think, in July, 1862. From that time to the present I have been engaged in investigations how to produce the material cheaply, and how to dry or coagulate it rapidly. In both particulars I believe I have succeeded so far as to warrant the importation of steam machinery to be applied to its extraction, and by a fortunate accident I have discovered how to dry or coagulate it, preserving the characteristic of elasticity at a single operation, by the addition of a simple ingredient not very costly.

The samples forwarded consist of—1stly, a bottle of milk, as extracted from the tree by tapping; 2ndly, of lumps or cakes, weighing together five lbs., of this milk prepared for the market; and 3rdly, some balls to show, by the result of the process discovered by me, that this material is nearly as elastic as india-rubber; indeed, as far as I can judge, *Balata* cannot be rivalled by either that material or gutta-percha, possessing, as I before stated, much of the elasticity of the one and the ductility of the other, without the intractability of india-rubber or the brittleness and friability of gutta-percha. Amongst the useful properties possessed by *Balata*, I believe the fresh-milk of the bullet tree to be the best waterproofing material yet discovered, and further, that *Balata*, as prepared by me, will supply the great want of the day, as a good insulating medium for telegraphic purposes.

The bullet tree is a magnificent timber tree, often squaring 30 to 40 inches, and is much used, especially in Berbice, for building purposes. The milk, when quite fresh, is so bland that it is sometimes used as a substitute for cow's milk, and the fruit is delicious.

The bullet tree abounds in many districts of the colony; indeed, I may say, throughout this part of South America, and I trust that *Balata* may ere long be added as an important item to the exports of the colony, and tend to prove that the International Exhibition of 1862 has in this instance also been productive of practically useful results, not only to this community, but to the interests of science and art generally.

I annex a letter from the Honourable William Walker, Government Secretary of the colony, and Chairman of the Correspondence Committee of the Royal Agricultural and Commercial Society of British Guiana, which is affiliated to the Society of Arts, in order to fulfil the conditions specified in the prospectus.

Proceedings of the Society.

CANTOR LECTURES.

Fine Arts Applied to Industry. By W. Burges, Esq.

Fourth Lecture, Monday, Feb. 22.—Iron and Brass.

The first point noticed by the lecturer was the great employment of bronze in the classical era, it being used for most of the articles that we commonly manufacture in iron. Bronze statues were also numerous, although very liable to be melted down if the persons to whom they were erected became unpopular. Mention was made of the celebrated bronze colossi at Rhodes and Athens, as well as of several other *chefs-d'œuvre* of ancient art. Attention was drawn to the various methods employed in the decoration of bronze statues in the classic times, such as damascening, gilding, and the substitution of silver, ivory, and other substances in the eyes. As regards mediæval bronzes great stress was laid upon our own series at Westminster Abbey, so much being known of the artists and of their rate of payment; and after noticing the great antiquity of bronze castings in the East, and the great skill of the Japanese in this art, the lecturer referred to the present state of these manufactures in France and England, very little being done in our own country. In France, M. Barbédienne deservedly holds the first rank, for the extreme care displayed in the casting, although some doubt was expressed as to the expediency of copying works in marble by reducing them as bronzes. After describing the Damascened dinanderie produced at Mossul, in the 12th and 13th centuries, and Hart's and Harding's imitations of that of the middle ages, the lecturer referred to the prevalent use now made of iron, both wrought and cast, observing that at present we had no very good means of judging whether structures built of this metal were likely to be permanent, and adding that there was very great room for a much more extended application of art to engineering works than had hitherto been made. The ironwork of the twelfth and thirteenth centuries was pointed out as models to be followed in the designs for elaborate works for doors, screens, and other small objects, the ornament being obtained by means of iron stamps, while the practice of the 14th and 15th centuries, of getting the effect by placing thin perforated plates one behind another, was by no means to be so much approved. A screen, however, executed by Hardman in this manner, and placed in the late exhibition, was mentioned with great praise for its delicate workmanship. Mr. Burges concluded by strongly advocating the application of art to works in cast-iron, and by suggesting several methods whereby this might be decorated. The table presented a most interesting show of works in bronze, Messrs. Jackson and Graham having kindly lent a selection of the best productions of M. Barbédienne; Messrs. Aubert and Linton also lent some fine bronzes and specimens of or-molu work. Mr. Wareham contributed some very curious Chinese and Japanese figures and vases, while Messrs. Hart and Son and Messrs. Hardman contributed some fine specimens of modern ornamented brass and inlaid metal-work. The specimens of cast-iron were due to the foundry of Mr. Macfarlane, of Glasgow, and Bedford-street, London; and several bronzes and electrotypes had been kindly lent by Messrs. Elkington and Co.

Twelfth Ordinary Meeting.

Wednesday, March 2nd, 1864; Robert Bentley, Esq., Professor of Botany, King's College, London, in the chair.

The following candidates were proposed for election as members of the Society:—

Benham, Edward, 18, Essex-street, Strand, W.C.
Boxell, Thomas, 43, King's-road, Brighton.
Greig, Robert, 33, The Cedars, Putney, S.W.
Martin, Claude, Park-cottage, Acton, W.
Parry, Robert Seaton, Balham Hill, Surrey, S.
Robinson, S., 60, Church-gate, Stockport.
Ruddock, Samuel, 22, Bloomfield-terrace, Pimlico, S.W.

The following candidates were balloted for and duly elected members of the Society:—

Blackburn, Henry, 27, Victoria-street, S.W.
Smith, S. Pountney, The Limes, Shrewsbury.
Steele, Edwin Breare, Vauxhall-cottage, Parkhall-lane, Leeds.

The Paper read was—

ON THE VERIFICATION OF OLIVE OIL BY MEANS OF ITS COHESION FIGURE.

By Charles Tomlinson, Esq., Lecturer on Physical Science, King's College School, London.

Probably at no period in the world's history has the olive tree been unimportant. It is mentioned not far from the first page of Sacred History, and again not far from the last. It furnishes many of the inspired writers with metaphoric illustrations; and we gather from St. Paul's writings that in his time the wild olive tree was distinguished from the cultivated variety, and that the practice of grafting was well known. In all ages the olive tree has been a source of wealth to the temperate regions where it flourishes. Italy exports vast quantities of olive oil every year; Tuscany to the value of nearly £80,000; Lucca, £40,000; the Neapolitan Provinces to the value of £740,000. In 1862 we imported 21,095 tuns of olive oil, of the value of £1,211,306 sterling, and in 1803, 19,866 tuns. The oil is consumed for the purposes of eating, for perfumery, soap-making (the finest Castile soaps are from olive oil), for the woollen and other manufactures, and for lubricating machinery.

Connoisseurs in olive oil admire the fruity taste, for which purpose the French growers in Provence gather the olives shortly before they have arrived at maturity. If the fruit is left till it is quite ripe it yields an equally fine oil, but has no taste of the olive. If the fruit is too ripe the oil is fatty and liable to become rancid. For the finest or virgin oil the olives are placed under shelter, in thin layers, for from twenty-four to forty-eight hours, until they begin to shrivel, but for the ordinary oil they are left in heaps for weeks, and even months, in the course of which fermentation sets in, which, it is supposed, increases the quantity of oil or enables it to separate more easily from the vegetable mucilage. If the olives get mouldy, or stick together, or discharge a reddish liquor, or rise in temperature to nearly 100° F., an acrid oil is produced, fit only for soap-making or the woollen manufacture.

For getting out the oil the fruit is crushed under edge stones, put into bull-rush mat bags, and slowly pressed in a screw press; the oil is received into casks or stone cisterns, filled about two-thirds with water. This is the finest or virgin oil. The contents of the bags are mixed with boiling water, turned once more into the bags, and pressed again. As the oil accumulates on the surface of the water it is skimmed off with flat ladles; it forms a good eating oil, but is apt to become rancid. The water also contains a quantity of oil entangled with the mucilage. By long repose in a large cistern it gradually parts with it, the water is drawn off at the bottom, and the oil that is collected is used in manufactures. The mass is next crushed at the mill, treated with boiling water, and expressed, when a still coarser oil is produced. All the oils are fined by keeping about twenty days in clean tuns, at a temperature not under 60°. The oil is then run off into strong casks, left to cool in cellars, and is ready for the market.

It is calculated that 100lbs. of olives will yield 32lbs. of oil, 21lbs. of which are from the pericarp, forming the finest oils, 4lbs. from the seeds, and 7lbs. from the woody matter of the nut; but the latter oils have an unpleasant flavour, and both soon become rancid. The oil of the skin resembles that of the flesh, but contains an essential oil in addition, so that the olive, when perfectly mature, contains no less than four different oils.

In Spain the olives are left a considerable time after gathering, and hence the oil has a greenish colour and a strong taste, which, indeed, the Spaniards prefer. The olives are first pressed between conical rollers, kept a certain distance apart to prevent the kernel from being injured, after which the oil is drawn by pressure.

Italy and the Italian islands may be considered as the classic land of the olive. The trees grow to a large size and the cultivated varieties are numerous. The climate is well adapted to the plant, which requires a mild winter for its safety, and a hot summer and autumn for maturing its fruit. The finest oil, known as sublime and extra-sublime, is prepared from perfectly sound olives, gathered by hand, instead of the rude method of beating them from the trees, as in France, and they are not allowed to ferment. Such an oil is perfectly transparent, of a deep rich yellow colour, with much body, moving sluggishly when shaken, and keeping two or three years without contracting a disagreeable taste or smell. The Italians prefer the oil with a fruity taste; *con multo frutto* as they call it, or as the French say *qui sente son fruit.* For the English market an oil is prepared with very little taste or smell. It is remarkable that new olive oil has a pungent taste, like that of pepper, a property common to all the best oils; it goes off in from three to sixweeks, and is, I imagine, due to the essential oil of the skin. Still, however, the oil of Bari has a pungency which is not only excessive, but permanent.

The finest oils are produced, perhaps, in Tuscany, but once in about four years Bari furnishes oils equal to those of Tuscany, but differing from them in four particulars:—(1) In being paler; (2) in being more pungent and the pungency permanent; (3) in having less body; (4) in not keeping so long. Tuscany produces a variety known as white sublime oil, which is mostly sent to Paris. In extra sublime oil the qualities of the sublime are carried out to a very high degree. The Tuscan sublime oil may be regarded as the type of the eating oils. There are other qualities obtained by a second pressure of the pulp, known as superfine and fine. These do not depart so far from the type as to prevent them from taking rank as eating oils. Oils from Genoa and the Riviera are inferior to those of Tuscany, and are known in commerce as No. 1, No, 2, and No. 3; but No. 3 scarcely takes rank as an eating oil. Some of the inferior oils, produced by treating the pulp with boiling water, are used for burning, soap making, &c., and the last yield is a green, half-concrete oil, used in manufactures. The oil-cake is used for feeding cattle.

Tuscany oil is shipped from Leghorn in pipes of about 110 gallons; in hogsheads of 60 gallons; in quarter casks of 30; in jars of 20 to 21 gallons; in half jars of 10; and in quarter jars of 5 gallons. The jars are glazed on the inside, but there is a considerable absorption of oil, often amounting to 2 gallons per jar. The jars are packed in basket-work or cord netting. The oil is also imported in half-chests, containing 2½ gallons, in 35 flasks, and also in square boxes. A plain flask[*] of oil, with its straw covering, weighs 14 ounces, but there is a smaller kind weighing 12 ounces. The pipes on board ship leak somewhat, but a leakage of two gallons per pipe is not complained of. The half-chests and boxes suffer from the depredations of rats and mice; they nibble away the bladder and wool that stop the flask, and get at the oil by inserting their tails in the neck.

The oil contracts considerably in freezing, so that a pipe of frozen oil will gauge several gallons less than when quite liquid; sellers are sometimes cheated in this way. There is an idea in the trade that frozen oil should be thawed by putting the vessel in hot water, because a dry heat near the fire has a tendency to turn the oil rancid.

The plant is subject to the attacks of insects, in which case the oil will not readily become bright, and the flavour may be rotten and unpleasant. Frost is a great enemy to the olive tree, as it makes the fruit fall before it is matured.

A large part of the old Neapolitan kingdom, forming the heel of the boot, is all but one continuous olive grove, but the quantity of fruit varies considerably in different years, so much so as to affect the very *idiom of* the language, so that one in a gay humour is said to be as merry as if he had *la buon' annata*, or the "good year of olives;" so a man in a bad humour has had *la cattiva annata*, or the "bad year of olives." Indeed, the short words yes and no (*si e no*) have reference to good and bad crops. The great depôt for oil is at the seaport of Gallipoli, which has given its name to the oil which is so largely imported for manufacturing purposes, especially in the woollen trade. The town is built on a rock, which is cut into huge cisterns for the reception of the oil, where it clarifies, and can be kept for a long time without turning rancid. A Gallipolitan warehouse is usually on the ground-floor, and, on entering, one is struck by the appearance of circular holes in the floor about two feet in diameter, like the mouths of wells. These are the mouths of separate cisterns in which the oil, in its different stages, is preserved. In fact, a turbid oil, almost as black and thick as pitch, becomes bright and yellow in these cisterns. The oil is brought in sheep or goat skins on the backs of mules, from the different towns and villages in the Terra d'Otranto, or the more distant province of Bari. When the oil is to be shipped it is drawn off from the cistern into skins, and so conveyed on men's shoulders to a small house on the sea-shore, and discharged into a large open basin or measure. From this a tube communicates with a cock outside the house, from which the casks are filled for the ships' cargo.

The olives which furnish the Gallipoli oil are allowed to mature on the tree, and when they have fallen are picked up by women and children. The machinery for pressing and crushing the oil is of the rudest kind, but it is hoped that the improved political condition of Italy will rapidly extend to the south the various improvements which have already been or are being made in the north.

An oil that fetches a wholesale price of from 5s. to 7s. per gallon offers many inducements for admixture with cheaper oils; and there are two oils which are chiefly employed for the purpose; the first is sessame oil, which is largely crushed at Marseilles from seeds chiefly obtained from the Levant, and much used for food in the south of France by the lower orders.[*] It is usually mixed with olive oil when the latter is dear. But the best substitute for olive oil is that obtained from the seeds of the tall white poppy; this is extensively prepared at Lille in the north of France, and also at Marseilles.[†]

There is no good method of detecting these admixtures, and, indeed, few things are more difficult than the determination of the purity or want of purity of any given fixed oil. I am told that an easy method of discriminating between different oils in common use, with a view to the identification of pure types, as well as admixtures, would be a great boon to the oil trade. Such a test I venture to propose to-night. It is a physical test, based upon the two forces of cohesion and adhesion. If, for example, we gently deposit a drop of oil on the surface of chemically clean water in a chemically clean glass, the adhesion of the surface spreads the drop of oil out into a film; the cohesion of the oil strives to resist this diffusion, or, yielding for a moment, the cohesion re-asserts itself, and the oil gathers itself up in opposition to the adhesive force, and the result of this struggle is a figure, which I name a cohesion figure. I believe that every independent liquid, that is not a solution, has its own peculiar cohesion figure. The figure may be represented by the functional equation $F = f\ (C\ A\ \delta)$, in which F is the figure, C the cohesion, A the adhesion, and δ the diffusibility. If two or more liquids could be found of different chemical composition, but alike in their physical characters, such as their specific gravity, molecular attraction and relations to heat, whereby at a given temperature they are equally fluid, limpid, or viscid, then doubtless the cohesion figures of those two liquids would be identical. I have succeeded in converting the cohesion figure of one essential oil into that of another, by dissolving camphor in one of them, but in such case other characters were introduced which disturbed the comparison.

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[*] There are several kinds of flask, known as plain, fancy, ribboned, decanters, pyramids, and squats. The last three sorts are packed in square boxes; the first three in half-chests, shaped like a Noah's ark.

[*] According to Lindley ("The Vegetable Kingdom, 1846,") the seeds of *sesamum* are expressed in Egypt in great quantities. The oil is sometimes called *gingilie* or *gingelly oil*, and if of very good quality is used for adulterating oil of almonds. It is as tasteless as olive oil, but is apt to become rancid.

[†] The seed of poppy is generally in no degree narcotic. According to Lindley, "the oil obtained from the seeds of *Papaver somniferum* is found to be perfectly wholesome, and is, in fact, consumed on the continent in considerable quantity. It is also employed extensively for adulterating olive oil. Its use was at one time prohibited in France by decrees issued in compliance with popular clamour, but it is now openly sold, the government and people having grown wiser."

As the cohesion figure of a liquid depends essentially on the adhesion of the surface, it is quite necessary that that surface be chemically clean. The water need not be distilled; the New River Company's water being well adapted to the purpose, but the vessel must be specially prepared. All vessels exposed to the air contract an organic film, from the condensation on their surfaces of the breath of animals, &c., and also other impurities arising from the products of combustion, dust, &c. If we attempt to clean the glass with a duster, however well we may satisfy the eye, we do not remove this organic film; or if we remove one film we substitute another from the cloth we hold in the hand, so that when the glass is filled with water, the film in question is detached, and spread over the liquid surface, effectually preventing adhesion.

The plan I recommend is to appropriate certain glasses, about four inches in diameter at the mouth, to the purpose; to wash them out occasionally with commercial sulphuric acid, to rinse with water, and after every experiment to wash out the glass with a solution of caustic potash, and to rinse with water before filling up again. The water must be allowed to come to rest before the drop is deposited. The glass rods kept for the purpose should be of the same size, and these may, for convenience, be kept in the caustic potash vessel. When one is taken out for use it should be shaken in water and wiped dry on a clean cloth. On dipping it into the oil, &c., it may be stirred round to mix the layers, if any, and then allowed to drain until the drops fall slowly, and the eye must determine when the rod is to be carried over the water so as to deposit one and only one drop, neatly and gently, without any disturbance. In this, as in all other matters, doubtless each operator will have, what the astronomers call his "personal equation," so that one man's result may not be as neat as that of another; but if the directions be attended to, sufficiently good cohesion figures will be produced. Gentlemen have come to me and have complained of their inability to get consistent figures, but on inquiry I have found their glasses not clean, or the mode of depositing the drop unsteady. I have even seen an operator let the liquid fall from a height of ten or twelve inches. Of course, in such a case the result is unsatisfactory, and with liquids somewhat heavier than water, such as creasote, carbolic acid, oil of cloves, and the heavy oil of cinnamon, such a mode would simply send them to the bottom of the vessel, whereas, if gently deposited, these liquids, though heavier than water, will form good figures on its surface. I may further remark that in the case of fixed oils it is of no use placing a second drop on the surface should the first one fail, because the first drop forms a film, whether visible or not, quite sufficient to destroy the adhesion between the surface and the second drop. This remark does not, however, apply to some of the essential oils, where a second drop will often displace the film formed by the first; but even with other essential oils, such as turpentine, a second drop will roll about on the film formed by the first drop, affording a good illustration of the spheroidal condition of liquids at common temperatures.* In the case of the ethers, alcohols, &c., their diffusibility is so great that the cohesion figure produced by them lasts only a fraction of a second. Hence, in order to study these figures with advantage, they must be repeated in rapid succession, for which purpose the liquid is to be taken up in a pipette or dropping tube, and so delivered to the surface of the water in successive drops as fast as the figures expand, contract, and disappear.

Creasote is a very good liquid with which to begin the study of cohesion figures. A single drop delivered to the surface of water may split up into a number of separate cohesion figures, or, in a warm room, form one figure about the size of a sixpence. This will last several minutes, sailing about on the surface of the water, struggling with the adhesive force which is constantly tearing from its limiting edge small portions of its substance, while the flattened drop is all the time seeking to resist this attack. It gathers itself up all round, and the result of these two actions, the adhesion of the surface which tends to spread out the figure, and the cohesive force of the creasote which tends to gather it up, gives a characteristic figure with a pulsating or crispating edge. This figure, however, is not altogether peculiar to creasote, but its duration is peculiar; for while a drop of creasote on the surface of two ounces of water goes on crispating for about seven minutes, until it is disposed of by solution (or in other words, when the adhesion of the water has entirely overcome the cohesion of the liquid), a drop of oil of cloves will go on crispating a much shorter time, and after an hour or more a portion of the drop will be left, that is, the adhesion of the water is much sooner satisfied in the case of oil of cloves than in that of creasote. There are also other differences in the appearances of the figure, as will be seen by referring to the diagrams on the wall.

It is obviously of no use to place a second drop of oil of cloves, or of oil of pepper, which behaves somewhat like it, on the surface, seeing that the first drop more than satisfies the adhesion. We may, however, place a second drop of creasote on the surface after the first has disappeared, when the struggle between cohesion and adhesion recommences in a mitigated form. The first drop is disposed of in two ounces of water in 7 minutes; the second drop disappears in 12½ minutes; a third drop in 25 minutes, but the fourth drop gives no cohesion figure at all. These two ounces of water are now saturated; that is, the adhesive force of the water for creasote is destroyed. Increase the quantity of water and the adhesive force is restored in proportion to the quantity, and the struggle between the water and the creasote sets in again, accompanied by the characteristic figure of the creasote. Here is a specimen of carbolic acid. Its figure is very different from that of creasote, and its duration very much less. It is distinguishable in this way in a moment from creasote, and this may be of importance when it is remembered that much of the creasote of commerce is nothing more than carbolic or phenic acid.

With respect to the duration of cohesion figures the results are very variable, ranging from the fraction of a second, in the case of ether, alcohol, wood spirit, &c., to some hours in the case of some of the fixed oils. And among the volatile oils the characteristic portions of some of them are very permanent. Thus oil of turpentine flashes out into a beautiful film covering nearly the whole surface of the water, a double row of bosses of unequal size forms at the edge, the smaller bosses outside, bands of iridescent colour form on the surface, the film then opens into numerous small holes, and the final result is a network of great delicacy and beauty which is very persistent. Oils in the turpentine series, such as juniper, savin, cajuput, bergamot, &c., pass through these four phases with differences characteristic of each oil, often producing forms and combinations of colour of extreme beauty; and I cannot help thinking that the pattern designer might obtain hints from many of the cohesion figures for new and striking patterns.

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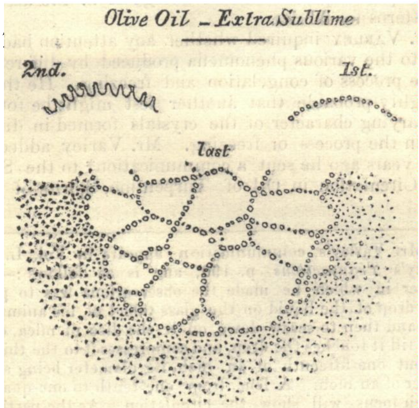
* The author has a paper on this subject in the Philosophical Magazine for December, 1863.

In the production of these figures some attention to temperature is necessary. Many of the fixed oils are sensitive to the cold, so that if a drop be placed on the surface of water from a cistern, say of 40°, it may be chilled, and the experiment fail, whereas, it may be quite successful if the water be left for a time in a room at about 60° F., which may be taken as the mean temperature of an inhabited apartment in this country, both in winter and in summer.

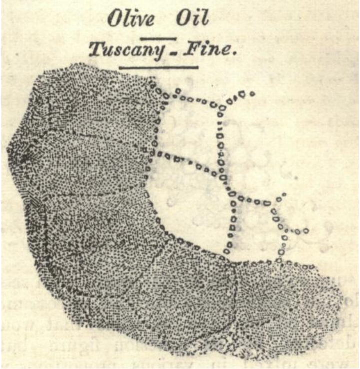
Another precaution refers to extent of surface. By increasing this we increase the adhesive force, and the figures may be poor and thin, and even torn up before their characters can be studied. I have found a surface of four or four-and-a-half inches well adapted to this inquiry. I have also procured a number of shallow glasses, two of which are on the table; they hold only a small quantity of water, but give the required extent of surface. The stem and foot raise them to a convenient height, and the stem allows them to be easily handled without bringing the fingers in contact with the edge or inner surface of the glass. An opaque vessel, such as a saucer, is not adapted to these figures, which are difficult to see in an opaque vessel.

I have detained you thus long on the subject of cohesion figures in general, in order to show the extent of the application of this physical test. I come now to apply it to olive oil. When a drop of this oil is placed on the surface of water it spreads out slowly into a large disk with a raised edge. The cohesion of the oil soon begins to re-assert itself; the film retreats upon itself; the raised edge at first shows symptoms of the returning force of cohesion; a number of dots appear at the edge, like beads strung upon a thread, the spaces between the beads open, and the edge becomes deeply serrated; separate portions of the film gather themselves up simultaneously, leaving polygonal spaces, bounded by strings of beads or bosses, and filled with an exceedingly minute dew or spray, which requires a sharp eye to detect. All these changes occupy about 35 seconds.



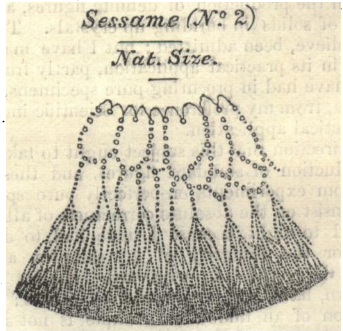
The above description refers to an extra sublime oil, marked "Tuscany, November, 1861," furnished me by my friend, Mr. Edgar, to whom we are indebted to-night for some of the statistics of the olive oil trade that I have laid before you.

Another specimen, marked "Superfine Tuscany, Nov., 1861," presented similar phenomena, but the duration was about 75 seconds. A specimen, marked "Tuscany, Fine," opened with a display of iridescent rings, a not uncommon phenomenon; these soon disappeared, and the film gathered itself up somewhat after the manner of the other two specimens.

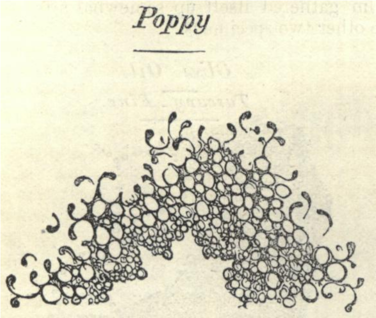


In these and other trials with oils from other parts of Italy, such as Genoa, Bari, Naples, &c., slight differences could be noticed by the practised eye, and it is quite possible that any one interested in the subject might be able to distinguish between olive oils of different growths and degrees of fineness. This, however, must be a work of time and patience, and the comparison of a large number of specimens, in order to complete that education of the eye which is more eloquent to the operator than written descriptions or pictorial designs.

Mr. Edgar, being interested in the olive oil trade, came to me and inquired whether my method would enable him to distinguish between olive oil and sessame seed oil, which is often substituted for it or mixed largely with it. After one or two meetings we were sufficiently agreed that olive oil had its own cohesion figure, and that oil of sessame has also its figure, which could not for a moment be mistaken for that of olive, or, indeed, for that of any other oil with which I am acquainted. The specimen tried was marked, "Sessame seed oil, No. 2, pressed at Marseilles, April, 1862." It forms a large, well-shaped, and well-developed film, and when cohesion reasserts itself, it retreats inwards with a deeply-scolloped edge and radiant lines of dots, leaving a pretty cobwebby figure resembling lines of cobwebs covered with dew; these phenomena last about sixty seconds. The diagram on the wall will convey, perhaps, a better idea of the figure than my description.



Again, poppy seed oil is often used, especially on the Continent, to mix with olive oil, and is even a better substitute for it than sessame. A specimen furnished to me was marked "Poppy seed oil, *Huile d'Oeilette*, Marseilles, June, 1860." A drop of this oil placed on water opened quickly into a film, shooting out as it were small disks upon the surface, and forming iridescent rings, in the midst of which a perforated pattern opens, which I have attempted to represent in the diagram.



Now, suppose olive oil to be mixed with sessame seed oil—I do not contemplate the case of sessame seed oil being palmed off for olive oil, since that would be instantly detected by its cohesion figure—but suppose sessame were mixed in various proportions with olive oil, the resulting figure would be neither that of olive nor that of sessame, but a compound of the two, the characters of the figure inclining to that of the oil in excess; so that it is quite possible, from an inspection of the figure, to say which oil is in excess, and by a few trials to produce a mixture identical with that of the fabricated specimen which was first submitted to examination. I need not say that this species of analysis may come to be of great value in the oil trade. Indeed, a gentleman in this trade, who, I believe, has long occupied a post at the Council Board of this Society, inquired of his scientific chemist whether my method was capable of distinguishing between the oleines of beef tallow and mutton tallow? "If it can do that," he remarked, "it will be a grand thing!" The chemist in question prepared his own specimens, and watched me while I performed the experiment, and the result is before you in the diagrams on the wall, by which it will be seen that the cohesion figures of these two oleines are essentially different, although the substances that produce them are apparently so much alike.

I need hardly say that mixtures of olive and poppy admit of easy detection, for, as Mr. Edgar remarked at the close of our examination of his specimens, "The oils write their names on the surface of the water!"

When I brought this subject before the British Association at Manchester two and a-half years ago, my object was rather scientific than practical. I wished to establish the principle that cohesion asserts itself in the case of liquids in the production of definite figures, as it does in the case of solids in building up crystals. The principle has, I believe, been admitted; but I have made no great progress in its practical application, partly from the difficulty I have had in procuring pure specimens, and partly, I suppose, from my preference for scientific inquiry rather than practical application.

The direction that this subject ought to take is towards the production of standard figures, and these can only result from experiments on perfectly pure specimens. I do not insist on the absolute correctness of all the figures exhibited to-night, because I have had to depend upon others for the integrity of my samples, and, in like manner, the gentlemen who have supplied me may, in their turn, have had to depend on others; so that the production of an undoubted sample is not always easy. At the International Exhibition I often watched the process of crushing linseed and expressing the oil, and obtained specimens of the results, including the seeds. I thought I had thus obtained an undoubted specimen of linseed oil; but on examining the seeds they were found to be mixed with about one-fifth of other seeds, so that my specimen of linseed oil from this source could not be relied on. Other circumstances may modify the cohesion figure, such as differences in the climate or in the season under which the crop is gathered. Thus, oil of lavender varies somewhat in specific gravity in different years from the same farm, and I have observed that the beautiful Carrigeen moss pattern produced by this oil is more minute in some specimens than in others; but the pattern is still the same in the sense that the Queen's head is the same, whether seen on a sovereign or on a half-sovereign.

In the foregoing details I have referred to water as the adhesion surface, and the figures exhibited were obtained on such surface. Of course, if the figures be produced on another liquid they will vary as the force of adhesion varies. I have obtained some very striking figures on the surface of sulphuric acid, of acetic acid, and of mercury. The last is troublesome to clean, and the two acids are spoiled in the experiment. Except as a matter of scientific interest, and as a test of the truth of the theory of these figures, there is no advantage in employing these various liquids as surfaces of adhesion. Common water, as delivered by the water companies, if contained in a chemically clean vessel, is itself chemically clean, and well adapted to the purpose.

In conclusion, I would invite the attention of gentlemen interested, whether scientifically or practically, in oils and the great variety of liquids in common use, to examine this physical test, and determine for themselves whether it may not afford a ready off-hand method of ascertaining the purity or the kind of admixture in the liquids which are daily brought under their notice.

DISCUSSION.

The Chairman said he thought it advisable, in the first place, that gentlemen present who had any knowledge on the subject, should inform the meeting as to the various modes of expressing the oil from the olives in different countries, because he found, from Mr. Tomlinson's paper, that different oils varied in their cohesion figures. That might be important for future investigation. A still more important point was to consider the different substances which were used for the adulteration of olive oil; and, following upon that, would be the means of detecting this adulteration. They had frequently heard of the struggles for life amongst the members of the organic creation, but on this occasion they had had brought before them, in a very beautiful manner, struggles of a different kind in inorganic matter; and so beautiful were some of the forms presented by these phenomena, that he agreed with Mr. Tomlinson that they would probably be taken advantage of in the designing of patterns for fabrics.

Mr. Varley inquired whether any attention had been paid to the various phenomena produced by different oils in the process of congelation and freezing. He thought it highly probable that another test might be found in the varying character of the crystals formed in different oils in the process of freezing. Mr. Varley added that some years ago he sent a communication* to the Society on "Circulation in Oil of Turpentine, Spirits of Wine, &c."

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* Mr. Varley's communication appears in Vol. L. of the Society's *Transactions*, p. 190, and is as follows:—"The manner in which he made the observations was to place a small drop of the liquid on the glass tablet of his animalcula-cage, and then to screw down on it the disc of mica, or thin glass, till it touches the drop, and compresses it to the thickness of about one-fifteenth of an inch, its diameter being about a quarter of an inch. A lens from one-tenth to one-quarter of an inch focus, will show the circulation. As the particles of the above liquid are transparent in their pure state, and consequently not to be distinguished one from another, the circulation can only be shown, or rather inferred, from the apparent motion of foreign minute particles floating in the liquid, and of nearly the same specific gravity with it. If the liquid to be examined is quite clear, it may be fitted for observation by

Dr. Bachhoffner said he remembered perfectly well the experiments of Mr. Tomlinson many years ago, on visible vibrations, and in reference to the subject now before him he would ask that gentleman whether any of these cohesion figures might not be considerably modified by any tremulous motion to which the vessel might be liable. Although the vibration might not be sufficient to destroy the figure, it might, nevertheless, mislead the judgment upon the figure formed.

Mr. Bishop remarked that at Malfi, in the Bay of Naples, the olives, immense forests of which existed there, were of very small size; and all round Naples they were not so fine as in many other parts. Those of Tuscany were superior, but it was in Spain where the largest olives were to be seen. Judging from the appearance of the fruit, he should have thought the Spanish oil would, under proper manipulation, be the best that could be obtained. The olives of Spain and those of Northern Italy were very different in flavour. Those of Alicante possessed a fruity flavour, whereas those of Malfi had a peppery taste, and were altogether of an inferior quality.

Mr. G. F. Wilson, F.R.S., said one point had struck him on hearing the paper read, that Mr. Tomlinson had again illustrated what had often been seen in that room, how researches, begun in the interests of pure science, had ended in eminently practical results. Mr. Tomlinson's object had originally been rather scientific than practical, but he had arrived at results promising to be of great commercial value.

Mr. Edgar (responding to the Chairman's invitation) said the discussion of this subject was at present premature. It had not, as yet, been sufficiently ventilated. The time for discussing it would be after more extensive experience had been had of Mr. Tomlinson's process, and a larger number of facts had been ascertained. He had seen the experiments alluded to, and had repeated a great number of them, and he fully agreed as to the practical value of this discovery.

Mr. John Jones remarked that the quality of olive oil varied very much from one year to another. He would ask Mr. Tomlinson whether he was able to point out from the fruits of different years which oil was likely to remain good the longest? Because in certain delicate operations of machinery it was an object to get the very best quality of oil which would last the longest time without oxidising. Some qualities of oil would remain effective in machinery four or five years, whilst others would oxidise in less than twelvemonths. Persons who desired to send out their work very accurate, gave their personal attention to the selection of the olives from which the oil they used was extracted. They picked out only the fruit that was perfectly ripe, and they took only the first flow of the oil.

Mr. Hilton presumed the object of Mr. Tomlinson's experiments was to point out to the members of the oil trade a method of discovering for themselves perfectly genuine olive oil. He (Mr. Hilton) knew, from past experience, that perfectly genuine olive oil was an article of very limited supply in this country, but that of late years a very considerable improvement had taken place in the article of sessame oil. As there seemed to be no indication of an increased export of the finer eating oils, he would take this opportunity of asking whether sessame oil, produced from highly cultivated seeds, and deprived of all impurities and odour by refinement so as to make it almost tasteless, large quantities of which had been sent from France—whether there was any real objection to the use of that oil for eating purposes; because, if it were shown that sessame oil would serve the same purpose as olive oil, it would be a knowledge worth possessing, and would encourage a trade capable of being developed to an almost unlimited extent. With regard to the Spanish oil, it was well known to the trade to be unfit for culinary purposes in this country. The only oil used for those purposes come from Italy alone, and the quantity was not increasing. When there was a slight frost or a bad season the price of olive oil rose from £10 to £20 per ton. There had recently been a rise of £10 per ton in Italian oil, and though they might be highly delighted with these very beautiful experiments, still he was afraid, commercially speaking, they would find it difficult to procure really pure olive oils. For that reason he would ask whether there was any real objection against the use of properly refined sessame oil for the purposes to which olive oil was usually applied?

Mr. W. Hawes said the object of the present paper was not so much to introduce new oils as to teach the means of ascertaining the purity or impurity of those which were now in use. It appeared, judging from the statements in the paper, and the diagrams exhibited—and on this point he sought for information—that there was great uncertainty in the figures produced by the same description of oil under different circumstances: for instance, they were told that in one specimen of olive oil the change occupied 35 seconds, in another as long as 75 seconds, and in a third that iridescent rings were formed. It was clear that while one specimen of oil gave iridescent rings, other specimens gave a figure without them. Were they from that to understand that the oil which gave the iridescent rings was the pure oil or the reverse? or if the one was pure and the other was impure, what was the latter mixed with? He would ask Mr. Tomlinson how he accounted for the presence of iridescent rings in one figure and not in another, both figures being derived from olive oil. With regard to tallow oil and beef oil, Mr. Tomlinson, in pointing to those figures, stated that there was a similarity between them. He (Mr. Hawes) confessed he could not trace that similarity, but he should have liked to have seen the figure that would be produced by those two oils mixed together. As had been said, they had not knowledge enough of the subject yet, and they ought to feel obliged to Mr. Tomlinson for bringing these facts before them; and this might lead others to make experiments and thus to a further increase of knowledge.

Mr. Langdale suggested that it would be very valuable to the trade if Mr. Tomlinson would publish these various figures. With regard to the sessame oil, no doubt it was now being produced in a very pure state, and entirely devoid of taste and odour, and under such circumstances he thought there could be no objection to an admixture of that oil with olive oil for eating purposes. Sessame oil could be produced very pure at 4s. 3d. per gallon, while the finest sublime olive oil was about 5s. 6d. per gallon. He saw no objection to the use of sessame oil, so long as it was sold as such.

Mr. Hilton remarked that the value of sublime oil at the present time was quite 6s. 3d. per gallon.

Mr. Tomlinson, in reply upon the remarks that had been made, said, in appearing before the Society this even-

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grinding with it a few particles of common coal, so as to render it slightly turbid. 1. A drop of spirit of wine, or of naphtha, placed as above mentioned, exhibits two, three, or four, vortices or centres of circulation, according to the size of the drop; and if these vortices are viewed laterally, the lines of particles will be seen forming oblique curves from top to bottom of the drop. 2. Oil of turpentine shows a rapid circulation in two continuous spirals, one to the right, the other to the left, around the drop. These meet in the opposite diameter, from which the particles are slowly carried across the diameter to the place of starting; and this continues while there is fluid enough to let it be seen. 3. If, however, the drop does not exceed one-tenth of an inch in diameter, it presents the appearance of particles continually rising up in the middle, and radiating in gentle curves to the circumference. 4. If the liquid be put into a very small vial, similar motions are perceived; the particles, when they have reached the side of the vial, going down, to rise up afterwards in the centre or axis. 5. If a bubble of air be enclosed in the liquid, motions similar to those described in No. 2 are observed in the part immediately in contact with the bubble. 6. In a flat drop of new wine, laid on the tablet, but not compressed by the mica, the motion was a regular uniform circulation; the particles rising from below at one end of the drop, then passing straight across on the surface, and descending at the other end."

ing with a new test for the verification of oils in general, and of olive oil in particular, he did not do so with that kind of finished knowledge which would enable him to put his hand on a particular specimen and say where it was grown, the size of the olives from which it was drawn, and similar particulars which required long practice and experience with a great variety of olive oils. If, for instance, a chemist presented a new mode of determining the per-centage of copper in a given ore, and that test were superior both in accuracy and brevity to the existing modes, it would not be fair criticism to turn round and say his test was not worth anything because he had not tried it on all the copper ores in the world. In like manner he offered to them a physical test for determining the purity or state of adulteration of a given oil. It was for gentlemen interested in the subject to try it for themselves. It was no answer to say that these figures did not agree with specimens which persons had tried for themselves: of course they varied. He had laid down the conditions of this test that the resulting figure was a function of the cohesion, the adhesion, and the diffusibility; vary these ever so slightly and the resultant would vary; but he did not think any one could look at the various figures from the various specimens of olive oil without seeing a family resemblance. That was all he claimed. Supposing the specimens furnished to him were commercially pure olive oils, he got a certain figure, and he ventured to say any other commercially pure olive oil all over the world would give, not perhaps identically the same figure, but a figure of the same character, and that they would not mistake the figure given by another oil, such as sessame or poppy, for that of olive oil. In oils of the same name there is that family resemblance which would enable a practised eye to say that is the figure of olive oil, that of sessame, that of poppy, and so on. The gentleman who sent various specimens of oil to him stated he could not answer for their purity, as he did not express the oil himself. As he had stated in his paper, he thought he had got a specimen of pure linseed oil from the press which was working in the International Exhibition, but on looking at the seeds which had been operated upon he found an admixture of from one-fourth to one-fifth of other seeds, so that even in that instance he was baulked in procuring a pure sample. The sum of the objections was simply this—in order to give a standard figure they must define what they meant by their oil. In olive oil there were certain difficulties. There were no less than four distinct kinds of oil obtained from the olive:—An essential oil from the skin, an oil from the kernel, there was the oil from the pulp, and an oil from the stone. As one gentleman had remarked, if the olive had arrived at maturity it was pressed between rollers a certain distance apart, so as carefully to avoid crushing the seeds, and this produced the oil from the pulp only; he believed they got in such a case commercially pure oil, but even that was a complex product. There was in the skin of the olive an essential oil, and it was that, he believed, which produced the hot, peppery taste. If the oil were kept for some weeks, this volatile oil disappeared, and with it the taste also, and they then got an oil which he believed was a fair exponent of olive oil. But supposing the olives were crushed beneath edge rollers, and the stones and kernels were crushed also, then they got all the four oils mixed together. A gentleman had furnished him with oil extracted entirely from the stones of the olive; that produced a different figure as compared with that of sublime olive oil. It was a green viscid oil, different in texture from the oil of the pulp. If they got all the oils mixed together, then they had a composite figure, and they could tell after some practice what were the constituents that made up that figure. With regard to the experiments alluded to by Mr. Varley, they were new to him. He had himself been working in the same direction without knowing that that gentleman had preceded him. He had often observed a similar action, knowing that there was no such thing as inert matter in nature, and he had contrived experiments in which the particles chased each other almost like water-insects chasing their prey. There was one other result he might mention. When a surface of acetic acid was obtained, a single drop of oil of camphor or oil of lavender deposited on that was exactly like a live thing moving about with waving cilia. As he had already stated, his sympathies were with the scientific part of the subject rather than the practical. Another gentleman had referred to a juvenile work of his on "Visible Vibration," experiments which he performed many years ago; but in answer to the question put as to how far vibration affected these figures, he would say that it interfered very much with them. His house was situated within a few hundred yards of a railway, and when experimenting in his private laboratory he was sometimes obliged to wait some minutes till a heavy train had gone by before he could go through an experiment. Certainly repose was necessary for these experiments on cohesion figures, but he hoped they would give him credit for being too old an experimentist to allow his conclusions to be influenced by an accidental source of that kind. A gentleman had spoken of the various species of the olive. Now, the characteristics of the figures would doubtless vary in the case of the wild olive, as compared with the cultivated varieties; but his position was this, that if the oil were olive oil, it must have a certain cohesion, a certain adhesion with reference to water, a certain specific gravity, and a certain molecular condition, whether viscid or fluid, which were all characteristic of olive oil. At present olive oil was commonly recognised by the taste, the colour, or the smell. With regard to his test, it was found that olive oil, whether from wild or cultivated fruit, would always yield a figure distinct from that of other oils. Each oil had a figure of its own, with variation in detail, while there was a general characteristic overruling the whole by which to judge of the oils in question. He begged to thank Mr. Wilson for the testimony he had borne to his experiments. With regard to the difference between the two oleines of beef and mutton, Mr. Hawes had remarked that he saw no resemblance between the two figures, but he (Mr. Tomlinson) thought there were very distinctive features in each case; in the one instance, the drop spread out into a thin film, and then opened into cracks in close contiguity with each other, the cracks radiating towards the centre; in the other instance the cracks were few and far between. It was this resistance in both cases to the force of adhesion that caused the cracks, and constituted the general resemblance between the two figures. He had not mixed those two oleines together, but that was an experiment which any one might perform for himself. He fully agreed with the observations of Mr. Edgar, that the subject was quite new, and that more observation was necessary. He was, however, quite convinced of this, that to get standard figures there must be a careful examination, not only of one olive oil, but of many varieties; the oils of different years, and of different parts of the world, so as to satisfy the eye and the mind of the observer interested in the subject, as to what really was the cohesion figure of olive oil. In reply to what had fallen from another speaker he would say he could not tell by the figures whether the oil would keep good or not, but he could tell this—that if the oil was old and organic changes had set in there would be certain additional phenomena in the developement of the figure in this test. One of those was the production of iridescent rings. Whenever there was an approach to fermentation there was a lighter oil produced, and there was a lighter film formed on the surface, which lighter film overrode the other and produced a succession of rings, a phenomenon that sometimes accompanied some of the fixed oils. In some oils, such as castor and croton oils, these iridescent rings were characteristic phenomena.

Dr. **Bachhoffner** inquired whether the presence of resinous matter in oils would interfere with the production of the iridescent rings.

Mr. TOMLINSON replied, the presence of resinous matter was indicated by the formation of a net-work. This was the case in oils of the turpentine series. Another gentleman had remarked that the Spanish oil was unfit for eating, and it was quite certain people of refined taste could not tolerate the rancid oil, which was due to the olives being kept in bulk for so long a time that they underwent the process of fermentation. As to whether there was any objection to the use of sessame oil, that was a question he was scarcely competent to answer, but he certainly thought there was great objection to the selling of one oil under the name of another. He had brought this subject forward, thinking it would excite interest and inquiry, but he had no intention of working much at it himself. His object was a scientific one, and having attained that he must leave it to others practically interested in the subject to carry it further; but if gentlemen would send him specimens of what were considered commercially or chemically pure oils, he should have pleasure in communicating the results of his experiments.

The CHAIRMAN said the time had now arrived for him to discharge the pleasing duty of proposing a vote of thanks to Mr. Tomlinson for his very interesting, instructive, and able paper. The subject was one of special interest, not the least of which was its novelty. Mr. Tomlinson had very fairly stated that he had not brought this subject forward as one which had been thoroughly investigated, but he certainly had done well to bring it before a society composed of men eminent both in science and practice, and he was sure the question, introduced in the able manner it had been, would be taken up by those interested in it, and further results might be expected to follow. Mr. Tomlinson, in his reply, had gone so fully into the subject that little was left for him to remark upon. He could corroborate what had been stated with regard to linseed oil. He believed it was next to impossibie to get a pure specimen of linseed oil. The detection of this adulteration was an important thing in an article which was so largely used by painters, because unless the linseed oil was good the paint did not harden or dry properly. So far as his own experience with linseed oil went he could fully corroborate what Mr. Tomlinson had stated. There was another branch of the subject to which he (the Chairman) had paid more attention. Mr. Tomlinson recently read a paper before a society with which he (the Chairman) was intimately connected, on the verification of medicinal oils, one of which, castor oil, was subject to a large amount of adulteration. He had been surprised at the results of his experiments, and he had no doubt the matter was capable of being brought to great perfection by means of the tests now introduced. One thing he had found to be very important in conducting these experiments: that was strictly to follow out the directions laid down as to having clean glasses and clean water. He would remark that the best olive oils he had seen were those from the south of France: and he believed the secret of the purity of olive oil was that the olives should not be too ripe, and should be pressed immediately they were gathered. He believed the secret of the excellence of the oil of the south of France to consist in that mode of operation, while the best Spanish oil, as had been already stated, was most unpleasant to the taste, and could not be used in this country for culinary purposes. The reason for the rancidity of that oil was properly stated to be that the olives were allowed to remain in heaps until fermentation was set up, by which a larger quantity of oil was obtained, whilst the quality was deteriorated in a corresponding degree. With regard to sessame oil, Mr. Tomlinson, in his remarks just made, had fully expressed his (the Chairman's) own views. He was not at present prepared to say whether that oil ought or ought not to be used for the purposes for which olive oil was generally employed. It might come to be merely a matter of taste. It was very desirable to have new oils introduced; and if sessame oil were sold as such, and were tasteless and good, he knew no reason why it should not be used. With regard to the tests for olive oil introduced this evening, there was no necessity to make further allusion to them, but reverting to the sessame oil there was a very distinctive test that could be applied to it to detect it from olive oil. If they mixed equal weights of olive oil and of a mixture of nitric and sulphuric acids the result would be the production of a yellow colour, while, if the same mixture of acids were applied to sessame oil, the result would be a bright green colour. That test had been introduced by a French chemist, and he had recently verified it himself. He thought they were much indebted to Mr. Tomlinson for bringing this subject before them. He had very modestly told them it was still in its infancy, but the having brought it before this Society was the proper way to get the matter more thoroughly investigated. He was sure he spoke the feelings of the meeting when he asked them to give a vote of thanks to Mr. Tomlinson for his very interesting paper.

The vote of thanks was then passed.

Proceedings of Institutions.

FAVERSHAM INSTITUTE.—Prizes were recently distributed by S. G. Johnson, Esq., to the successful candidates who had obtained prizes at the local examination. The awards consisted of educational and other works. Mr. Johnson congratulated the manager and committee on the great success which had attended their endeavours to extend the influence of the Institute in a new direction. This was the first time that an examination had been tried, and the result showed the foresight and prudence of the committee in its establishment. The prizes were for arithmetic, English history, writing, English grammar, reading, and geography, and varied in value from £1 to 5s.

HUDDERSFIELD MECHANICS' INSTITUTION.—The annual business meeting of this Institution was held on the 30th January; the attendance was not large. The chair was occupied by Mr. James Dodds. The 23rd annual report congratulated the members on the success of the Institution. During the past year the different branches of education had been maintained in their wonted efficiency, notwithstanding that there had been a decrease in the number of members. The issues from the library show a decrease of 828 volumes. The fortnightly meetings, one of the most interesting features of the institution, had been a great success, and a source of much pleasure and instruction to the members and their friends. The classes, 90 in number, have met five evenings in the week, and have been instructed by a very efficient staff of paid and voluntary teachers. The attendance was in 1862, 1,141; in 1863, 1,164. The drawing classes had been largely attended, and the results bore favourable comparison with those of any previous period. The average monthly attendance had been 368; an increase of 44. The progress made by the bookkeeping class had been very gratifying, and increased accommodation had had to be provided. The attendance at the loom class had been good throughout. Of the singing class the teacher reported that the senior pupils had made considerable progress. A larger number of students had attended the mathematical class than in the preceding year. The French class had increased in numbers, and was in a very efficient state. The slide rule class had passed through a very successful course and had again commenced. The chemical class had recommenced its studies, and was well attended. The Penny Bank again showed an increase in the amount deposited. The financial statement showed that the Institution commenced the year with a balance in hand of £38 17s. 7½d., and concluded it with one of 4s. The annual subscriptions amounted to £289 16s., and the subscriptions of fortnightly members to £315 1s. 6½d.; the total income of the Institute amounting to £738 14s. 1d. In reference to the Penny Bank, it was stated by Mr. J. Brook, when referring to the resignation of the manager, that during the last five years there had been, in connection with it, 85,633 separate cash transactions, involving the exchange of £11,222 7s. 5½d.

Mossley Mechanics' Institute.—The annual tea party and soirée of this institution was held on Saturday evening, the 20th instant. The tea was provided and served by a number of ladies of the neighbourhood, and after tea, George Andrew, Esq., of Apsley House, occupied the chair. The report was read, by which it appeared that the funds of the institution are in a prosperous condition, and that there is a steady increase in the number of the members, which in some degree may be attributed to the reduced charge for membership. The classes in existence are—writing and arithmetic, having 95 pupils, with an average attendance of 63; the English grammar class, comprising 40 scholars, with an average attendance of 30; the vocal music class, having 13 pupils, and an average attendance of 10. There are also classes for the study of geometry and book-keeping, conducted on the mutual improvement principle, with an average attendance of 6. In the library there are 950 volumes, and the issues during the year have been 2,600, being an increase of 747. Since the last tea party there have been seven lectures delivered. The meeting was addressed by the chairman, the Rev. H. Walthew, Dr. John Watts, Rev. E. Merton, Rev. J. P. Hopps, Rev. T. Smith, Rev. Geo. Fox, Mr. R. H. Buckley, Mr. R. S. Buckley, and Mr. Geo. Mitchell, Junior. The speeches were interspersed with songs and quartetts.

Otley Mechanics' Institution.—The annual meeting was held on the 29th January. Mr. Jeremiah Garnett occupied the chair. The report stated that the members now numbered 255, which was a decrease of 67, but this was partially owing to a careful revision of the old list. The receipts for the past year were £114, and the disbursements £106, leaving a balance in the treasurer's hands of about £8. The statement of the Penny Savings Bank was highly satisfactory, and showed that, exclusive of withdrawals, the deposits now exceeded £300. An interesting paper giving the daily readings of the meteorological instruments in connection with the institution, which showed a rain-fall of thirty-one inches, and that the temperature contrasted favourably with other inland towns, was also read.

Potteries Mechanics' Institution.—In the report presented to the annual meeting held at the latter end of January, the general committee states that for the first time during many years the institution was free from debt on account of its funds for working expenses. The income for the past year had been in excess of the expenditure, and had there been no special effort for the liquidation of the debt, the institution would have been in no better pecuniary position than it was a year ago. The number of members at the period of the last general meeting was 431, and at the present time it is 471. In reference to the lectures, the committee had made arrangements for a larger number than usual during the present winter. About one half of these had been already delivered, and while the attendance had not on the whole been commensurate with the excellence of the entertainments, the pecuniary deficit had been but small. Even this trifling loss had, the committee believed, been rather apparent than actual, as they considered that the privilege of attending at reduced rates a series of first-class lectures, &c., was an inducement to persons to join the institution, while in the case of some of the members, it formed almost the only return they received for their subscriptions. The English, French, and chemical classes were going on as usual. The average number of pupils during the half year was: English class, 25; French class, 10; chemical class, 7. The Art Workmen's Guild continued their meetings, which had been attended on an average by eight members. The bagatelle club was still very popular, but the chess club had latterly been inoperative. During the half year fifty-five volumes had been added to the library. Various contributions had been made to the museum. The committee believed that at no period in the history of the institution had its prospects been fairer, or its means of usefulness more efficient.

South Staffordshire Association for the Promotion of Adult Education.—A conference of this association, in connection with the district association of the Church of England Schoolmasters, was held on the 9th of February, at the new Mechanics' Institute, Dudley, under the presidency of Lord Lyttelton. The Rev. H. B. Bowlby, of Oldbury, read a paper on "Night Schools from a Manager's point of view." The peculiar advantages and disadvantages attending night-school work were noticed. With regard to finance the paper urged the desirability of keeping the day and night school accounts together, and as far as possible under the same management and staff of teachers, and supported by the same pecuniary resources. A second paper was by Mr. F. C. Hoton, of Wolverhampton, on "Night Schools from a Teacher's point of view." The paper advocated regular and punctual attendance of teachers and scholars, as without this no lasting success could be expected. He regarded much of the irregularity as owing to the fact that working men were frequently engaged in overtime at night-work. Voluntary teachers should be employed as helps to the regular teachers.—Mr. Talbot proposed a resolution to the effect that it is extremely desirable to have a full and well-digested report of the state of education of the juvenile working population of the district; of the circumstances which tend to hinder or promote the progress of evening school instruction amongst them. He expressed his belief that more should be done in the district in the way of systematic and close inquiry. During the past year he had passed through a phase of most valuable experience in connection with the evening school which he superintended. At the beginning of the year the school was attended by about 100 or 120 boys who were just such boys as were found all through the district voluntarily attending such schools. But in the early part of the last year a change was made; Messrs. Chance ordered an examination of all the boys employed in their glass works, and on the completion of the examination, the Messrs. Chance had brought their influence to bear upon the boys, and had ordered all who were found to be below a certain standard of intellectual attainment in the examination to attend the evening school. The result had been that for some time the former discipline of the school had somewhat suffered, and the difficulty of controlling and teaching the large number that attended had been great; but the plan had upon the whole worked well. This was the sort of thing that was wanted throughout the district.—The general conference commenced at seven o'clock, when Lord Lyttelton again presided. The Chairman briefly opened the discussion of the question, "How the masses of working men in South Staffordshire may be successfully approached in making efforts to improve their social, moral, and intellectual condition.—Mr. Wells, the Chairman of the Bilston Town Commissioners, thought that if the working people could be impressed with a desire to improve their houses, there would be enkindled a desire to obtain better clothes, and they would be more likely to find their way to church on Sunday than to the public-house. Mr. Beard, of Bilston, thought that the elevation of the working classes depended a good deal upon the employers themselves. There were two classes of men connected with the iron works who were very difficult to deal with, and those were the puddlers and the miners. He had found that in Yorkshire, Derbyshire, and other parts of the country, there was less difficulty in this respect. He accounted for this by the fact that, in the latter place, the employers establish large works, and are very careful whom they employ, and will not even take on a puddler unless he can produce a character from his previous master. It is not so in this district. If a man is discharged from a firm one day he knows he can get on at another the next, and no one asks him why or under what circumstances he left his previous work. Another system which prevailed in this district more than others in connection with mining, is the engagement of the working men by foremen, or middlemen, on whom they are to a certain degree dependent, and there is no direct interest between the employer and the employed. Many of these foremen are owners of beershops, tommyshops, &c., and the impositions and exactions which are put upon the working men by this system is one of the greatest evils of the district. This would not be the case if there was a direct engagement between the employer and the workman; and if the former would look more to the interest of those whom he employs, and take none but those who could produce a character from their previous master, the condition of the working men in this neighbourhood would be very much improved.—Mr. Hague (Bilston) suggested that the payment of wages a little earlier in the week would confer a great boon on the working classes. He read a communication from a large ironmaster, who had tried it in his works and found it to answer admirably, for the wives were able to make their purchases before the articles became a drug in the market, and get home at a reasonable hour on Saturday night, and not on Sunday morning as formerly. The men were able to attend the night school. Many large employers had adopted the movement, and amongst the men and their wives it was highly appreciated.—The Rev. J. H. Iles (Wolverhampton) entered at length on the subject of clubs and institutions by which working men might enjoy that agreeable intercourse which at one time could only be found at a public-house. He suggested the formation of a provident association, founded on the best principles and guaranteed by some of the most influential names in the district of South Staffordshire. He thought such a scheme might be made to work with satisfactory results, for it would check the present evil system of public-house lodges, and offer benefits on a firmer basis.—Mr. Talbot mentioned that such an association was in existence in Birmingham, and was in a very flourishing condition.—Mr. S. Lloyd (of Wednesbury) cordially seconded the proposition of the Rev. J. H. Iles, and entered into the subject of the present evils connected with the engagement of workmen by foremen, &c., instead of by the master, and the entire separation which there is between the employer and the employed. With regard to the early payment he said he had tried it with success for many years, and he found his men liked it much better.—Lord Lyttelton expressed himself in favour of the proposition.—Mr. Yeomans, a puddler, then read a paper showing the practical difficulties in the way of educating adults, and speaking of the good which might result if the men were approached in a kindly Christian manner.—The Hon. and Rev. W. H. Lyttelton advocated the establishment of working men's clubs and penny readings. A vote of thanks to the chairman brought the proceedings to a close.

SOUTH LONDON WORKING CLASSES INDUSTRIAL EXHIBITION.

On Tuesday, the 1st instant, a new exhibition of an interesting character was added to the numerous collections which already exist in the metropolis. The South London Working Classes Industrial Exhibition was formally opened, in the presence of a number of distinguished visitors. The exhibition, the contents of which, as its name indicates, are almost exclusively supplied by working men—is held in a commodious hall at the Lambeth Baths, Westminster-road. The hall, on the occasion of the inaguration, was gaily decorated with flags.

The exhibition has been got up chiefly under the auspices of the Surrey Chapel Southwark Mission, and the Working Men's Committee of the Hawkstone-hall Evening Service, Mr. G. M. Murphy acting as secretary. The hall is filled with articles of every variety, which show the intelligence and the ingenuity of the working men. The objects are stated to be the bringing to light the ingenious contrivances of working men; to show that hours well improved (instead of being spent in idleness, or, worse still, the public-house) may produce results astonishing to the working men themselves; to call attention, if possible, to the patent laws by which many of the useful inventions of poor inventors are to them almost useless, notwithstanding the thought, time, and toil spent in their production; and to give an impetus to the holding of similar exhibitions to the present in different parts of the country. The plan pursued was to go to as little expense as possible, and to try that, whatever the expense, it may be met by the exhibition. The number of exhibitors was stated to be 125, and articles exhibited 500, and these are classified under seven heads. 1. Useful. 2. Ingenious. 3. Ornamental. 4. Scientific. 5 and 6. Artistic and Literary. 7. Curious and Amusing. A catalogue is sold for one penny; the admission is two-pence each person. A memento of the exhibition is to be given to each exhibitor, and prizes to the most meritorious. The exhibition is to be considered in the light of an experiment, which, if successful, will be repeated in subsequent years. It is hoped that the money taken for admissions will repay the expenses. The exhibition was inaugurated under the presidency of the Earl of Shaftesbury, and the meeting was addressed by his lordship, the Rev. S. Newman Hall, Sir Samuel Morton Peto, Bart., M.P., Messrs. J. Bright, M.P., Warner, M.P., S. Morley, Johnson, and Burgess. The exhibition will remain open till Saturday, the 12th of March.

THE METROPOLITAN RAILWAY SCHEMES.

The following is the report of the joint committee of both Houses of Parliament appointed to consider the best method of dealing with the railway schemes proposed to be sanctioned within the limits of the metropolis by bills to be introduced in the present session, and to report their opinion whether any, and, if any, what schemes should not be proceeded with during the present session:—

" Ordered to report that the committee have met, and having jointly considered the matters referred to them, and having taken evidence of such agents and engineers of the several schemes as it appeared to them material to examine, have agreed to the following report, viz.:—

" The railway schemes that have been referred for the consideration of the joint committee, are of extraordinary magnitude for so limited an area as the metropolitan railway district, extending over a length of 174 miles in the aggregate, involving the raising of capital of nearly £33,000,000 in shares, and of £11,000,000 by loan, creating alarm among the holders of a vast amount of property, and interfering, during the construction of the proposed works, with many important public thoroughfares. They include the construction of not less than four new railway bridges across the Thames, two of them of gigantic size, below London Bridge. It is stated by the surveyor to the Commissioners of Sewers for the City of London that the lands and buildings scheduled in the City of London for the proposed railway schemes comprize about one-fourth of the entire area of the City.

" The committee are of opinion that the following bills or parts of bills should not be proceeded with during the present session:—Victoria Station and Thames Embankment, Oxford-street and City, London Main Trunk, Underground Metropolitan Grand Union (the portion south of Thames-street), Charing-cross (Northern), Charing-cross (Western), London Union, Metropolitan District (a portion forming the outer circuit), Tottenham and Farringdon-street.

" The committee recommend that the fees which have been incurred in respect of the said bills be remitted.

" The two first-named of these lines are proposed to be worked on the pneumatic principle—a principle hitherto untried as applied to railway passenger carriages, and it seems undesirable that the experiment should first be made in an important public thoroughfare. They are passenger railways, and are intended to relieve the streets of omnibus and cab traffic. The necessity for any such lines has been to some extent lessened, supposing the railways forming the inner circuit scheme referred to in a subsequent part of this report be sanctioned.

"The London Main Trunk Underground Railway proposes to provide a more central station for the Great Eastern, an object which is also sought to be accomplished by the Great Eastern itself, by the Great Eastern Metropolitan Station and Railway Bill. The select committee of the House of Lords on metropolitan railway communication of last session recommended that the Great Eastern should be allowed to establish a more central station than it has at present.

"The portion of the Metropolitan Grand Union south of Thames-street, which the committee recommend should not be proceeded with, involves a high-level bridge over the river below London-bridge. The connection between the railways north and south of the river at the east end of the metropolis might, it appears to the committee, be better effected by the East London, through the Thames Tunnel and the proposed abandonment approved by the promoters; and the committee recommend that they should be allowed to amend their estimate, and be permitted to withdraw a portion of their deposit.

"Three schemes on this list, the Charing-cross (Western), the London Union, and the portions of the metropolitan district railways proposed to be postponed, in addition to other objections, require the construction of bridges across the Thames, one of them being a high-level bridge below London-bridge.

"It is further to be observed with reference to these schemes that railway communication between the lines north and south of the Thames already exists on the Westminster side of the metropolis by means of the West London and West London Extension Railways, and another line is in course of construction through the centre of London by the London, Chatham, and Dover Railway, which when completed will unite their south London system with the Metropolitan Railway at the Farringdon-street station, thereby giving them a communication with the Great Northern lines, and thus of necessity connecting the Charing-cross and South-Eastern Railways at Charing-cross with any of the main lines to the north. Therefore the communication, as proposed by any of the last-mentioned schemes, is not urgent.

"The Tottenham and Farringdon-street Railway, by which it is proposed to connect the Cambridge line of the Great Eastern with the station at Farringdon-street, is open to the same objection urged against the Charing-cross (Northern) and the Tottenham and Hampstead (extension to Charing-cross), in that it tends to create a great central station, inasmuch as the Great Northern, the Midland, and the London, Chatham, and Dover Railway, are already brought in direct station communication with the Metropolitan Railway at Farringdon-street. As the Great Eastern Railway has another scheme for an improved station, which the committee recommend should proceed, it appears desirable that this bill should be postponed, at all events until it can be known by experience whether any inconvenient amount of traffic will be concentrated at Farringdon-street by the lines already to meet there.

"The estimated capital required for the construction of the schemes above proposed to be postponed amounts to £18,500,000 in the aggregate, exclusive of what was proposed to be raised by loan for the purpose of the undertaking. The remainder of the sum of estimated expenditure above referred to may be expected to be reduced by the rejection of some of the schemes allowed to proceed.

"Without expressing any opinion as to the merits of the following bills, the committee recommend that they shall be proceeded with in the ordinary course, being only improvements of existing lines or works connecting links of a very limited extent, for enlargement of stations in no way conflicting with any comprehensive system of Metropolitan railways—viz., Great Northern and Victoria Station; London and Blackwall (Extension); London, Brighton and South Coast (new lines in Battersea); Great Northern (No. 1 Barnet Branch); London and North-Western (additional powers); London and South-Western (additional works); North London (additional powers); London, Chatham and Dover (No. 1); London, Chatham, and Dover (No. 2); Great Eastern (Junctions, except Junction No. 8); Midland and St. Pancras Branch; Metropolitan (additional powers).

"The committee also recommend that the Metropolitan and St. John's-wood should be allowed to proceed, as it is a line that passes through a not very populous but increasing district without interfering with much property, and in no way competing with any other scheme. The committee may here remark that it is proposed to be as a single line only.

"The committee also recommend that the Hampstead, Midland, and North-Western and Charing-cross Junction shall be allowed to proceed. This scheme is in some degree open to an objection already referred to, that it tends to create a central station at Charing-cross. It, however, proposes an addition to the railway, which is to be constructed wholly in tunnel, to form three new streets, one of them of a very important character, in continuation of Tottenham-court-road from Oxford-street, in a direct line to St. Martin's-lane, near Aldridge's repository, and from thence to the Thames Embankment, near the Charing-cross Railway station. This new line of thoroughfare, which would be a substitute for the present objectionable road through Seven-dials, and High-street, St. Gile's, would be a great public improvement. The combination of new streets in crowded parts of the metropolis, with the construction of new railways, was recommended in the report of the Lords' committee last session. The committee are of opinion that if the select committee to which the bill for these schemes may be referred should see fit to sanction the scheme they should do so only on condition that the new streets above referred to should be constructed contemporaneously with the railway, and that provision should be made in the bill for ensuring its completion.

"The committee concur in the opinion expressed by the select committee of the House of Lords on metropolitan railway communication of last session, in their third report, that with a view to the distribution of passenger traffic arriving by the main lines of railway coming within the metropolis, and also the relieving the crowded streets by the absorption of a large portion of the omnibus and cab traffic, the completion of the inner circle of railways is desirable.

"It was estimated by the evidence before the committee that great additional accommodation, especially for the labouring classes, is daily becoming more necessary, while there is no prospect of the present ordinary means of conveyance being at all adequate to future wants, and they are of opinion that the following schemes, which contribute towards the formation of such a circuit, may properly be proceeded with—

"Metropolitan District Railways (the portion forming the inner circuit 32, 33, 34, and junctions 7, 8, and 9).

"Metropolitan Railway (Trinity-square Extension).

"Metropolitan Railway (Notting-hill and Brompton Extension).

"Metropolitan Grand Union (portion north of the Thames).

"The committee are also of opinion that the following schemes—viz., the East London, Great Eastern (Metropolitan stations and railways), Great Eastern (Junction No. 8), North London (Kingsland and Tottenham line), Walthamstow, Clapton, and City, may be properly proceeded with; and as these schemes more or less enter into communication with or compete or conflict in levels with the schemes above referred to, as designed to form the inner circuit, and with each other, the committee are of opinion that all the above schemes may with advantage be grouped together, and be referred to the same select committee.

" In making these recommendations, the committee are of opinion that the greatest accommodation to the public will not be secured by treating the two schemes which pursue almost the same line from Kensington to Brompton to the City merely as competing schemes, one of which is to be preferred to the exclusion of the other. The committee are of opinion that the promoters of these schemes should be recommended to communicate together, and with the surveyors of the City and Metropolitan Board of Works, and devise the most perfect line which their several plans will admit of. By a relaxation of the standing orders such revised plan may be embodied in one bill. The Metropolian Railway (Trinity-square Extension) and the Western branches of the East London Railway should also be part of the proposed consultation. By such a course much useless expenditure would be saved, and the interests of the metropolis far better secured than by taking the chance of selection of one among the competing lines.

" The committee observe with regret that two of the schemes which they have recommended should be allowed to proceed pass through Finsbury-circus in open cutting. They are, however, informed that the promoters of both are willing to substitute a covered way for the open cutting. In the event of the select committee finding it desirable to adopt either of those lines in preference to those which do not interfere with the circus, the committee recommend that effectual provision shall be made by which the time to elapse between the breaking up of any part of the garden and the completion of the works there and the proper restoration of the enclosure shall be as short as possible.

" Although the committee have recommended that those portions of the metropolitan district railways scheme which are designed to form the outer circle shall not be proceeded with, they concur with the House of Lords' committee of last session in thinking an outer circuit desirable, and they are of opinion that this object might be accomplished by uniting the existing railways on the eastern side of the metropolis with one another, and connecting those of them which are situate on the north side of the Thames with the railways on the south side, making use for this purpose of the Thames Tunnel. For this purpose it would be necessary for the East London to be in connection with the North London, the Great Eastern, and London and Blackwall Railways. This combination, taken in connection with the existing lines on the west and south of the metropolis, as suggested by the secretary of the London and North-Western Railway Company in his evidence before the committee, would complete the outer circuit, but it would be further necessary that mutual facilities to be secured by legislative enactment should be afforded by the several companies for the interchange of traffic.

" In order to give the public the full extent of the system of intercommunication such as that which has been suggested, it would be desirable that the select committee to whom the metropolitan schemes in question may be referred should require that such modifications may be made in the schemes that may be sanctioned as may be necessary for effecting the proposed combination, and also that a clause should be inserted in the bills of all railway companies having termini within the metropolitan district for securing a mutual interchange of facilities for working the traffic upon railways in that district on equitable terms among themselves, and without any undue preference, the terms to be settled in case of difference by the Board of Trade, or an arbitrator to be appointed by that department. A clause should also, they think, be inserted in each of the bills providing that railways having termini within the metropolis shall be subject to the provisions of any act to be passed in the present or any future session for the regulation of railways within the metropolis.

" The committee are of opinion that some of the provisions of the Railway Clauses Consolidation Act, 1845, require provisions in relation to the metropolitan arrangements, and they recommend the introduction of a bill for that purpose. They desire also to direct attention to a suggestion in Colonel Yolland's report to the Board of Trade as to the expediency of requiring all plans for railways within the Metropolitan Railway district to be drawn to the same datum line.

" The committee are of opinion that in the present session such of the bills proposing to sanction railway communication within the limits of the metropolis as are to be proceeded with should commence in the House of Commons."

The report concludes by stating that a map, showing the existing and proposed railways in the metropolis, accompanies the report, and that the committee have directed the minutes of evidence taken before them, together with the appendix, to be reported.

Fine Arts.

Paris Fine Art Exhibition.—Artists who intend to send works to the now annual exhibition, which is to open in Paris on the 1st of May, should remember that they must be sent in between the 10th and 20th of March. In connection with this subject it may be mentioned that exhibitions of works of fine art are expected to be shortly arranged in three of the most important provincial towns of France, of which Rheims, it is understood, is one. The matter is not yet definitely settled, but is expected to be so very soon.

Carbon Photographs.—At the last meeting of the Photographic Society of London some carbon prints, by Mr. Swan, of Newcastle, were exhibited, which gave greater promise than anything hitherto done in this direction. The description of the process by which they are produced will form the subject of a paper, to be read at the next meeting of the Photographic Society, in April.

Manufactures.

Solid Metal Tubing.—A new machine for drawing solid metal tubes has lately been tested in London with considerable success. The system was originally introduced into England by a French gentleman, about ten years ago, but in consequence of defective mechanical arrangements was at that time unsuccessful. The Stephenson Tube Company have lately erected extensive works at Birmingham for the manufacture of brass and copper tubes on this principle, but the new machine is especially adapted to the formation of tubes of steel, and other hard and close-grained metals. The ordinary method of forming wrought iron tubes is by bending round a long narrow plate of the metal so that the edges meet, and then having reduced them to a welding heat, to join them together by drawing the tube through a die made for that purpose. The machine in question entirely differs from this, and its action may be described as follows:—It consists of two large cast-iron cylinders, 11 feet long, placed opposite each other, and connected by a ram of 10 feet travel, which is driven out of the one and into the other alternately. On each end of the cylinders is a massive flange, pierced with eight holes, some four inches across; on the ram is a similar flange, but double, offering eight holes to each cylinder. The diameter of this hydraulic ram is 16½ inches, and the force obtainable upwards of 600 tons. A draw-plate or die of peculiar form is placed in one of the holes in an inner flange of one of the cylinders, and the tube to be drawn slightly tapered at the end, to allow of its passing into the die, is placed therein, having previously received a steel-headed mandril, intended to act on the interior of the tube. The tube is fixed on the flange of the ram by means of a screw pin projecting through the flange of the cylinder, and the stem of the mandril is fastened to the further end of the cylinder. The water being forced into the cylinder the ram is driven forward, and the tube is drawn bodily through the die, or draw-plate, and over the mandril, the head of which, inside the tube, is placed within the circle of contact of the die outside. By this means the tube is drawn externally and internally at the same time, and an eighth of an inch of steel may, at a time, be displaced from the surface, the tube being elongated proportionately; but in practice it is found more convenient to take off less at each pass in order to avoid fatiguing the metal overmuch. It is stated that two bars of rough iron, as delivered from the forge, 3½ inches diameter and 4 feet long, were placed in the machine and drawn through the die, the drawing occupying some five minutes. The bars issued from the die with a surface finer than can be obtained at present by any known mechanical means, except continued friction, and infinitely truer than any turning-lathe produces. It would take a man at a lathe two days at least to turn these bars, and he would then produce inferior results to those obtained in perhaps a quarter of an hour, if the time employed to fix and unfix the bars in the hydraulic drawing bench be included. It will scarcely be necessary to remark, in conclusion, that should this machine fulfil the expectations of the inventor it will cause a complete revolution in the manufacture of gun-barrels, hollow shafting, axles, piston rods, and such-like articles.

Band Saws.—A correspondent asks how it is that these saws are not manufactured of good quality in this country, and why the only band saws that are found to stand are made and imported from France? Why is Sheffield beaten in her own walk?

Nature Printing from Steel.—Mr. H. C. Sorby, F.R.S., whose researches into the microscopic character of the internal structure of steel are well known, has brought out an ingenious method of showing this structure, by making the steel become, as it were, its own block for printing on paper its peculiar characteristics; in fact, a species of nature printing. When iron is converted into steel by cementation, three distinct crystalline compounds are formed, two of which are readily dissolved by diluted nitric acid, whereas one is scarcely at all affected by it. If, therefore, a piece of steel be ground flat and polished, and then placed in the acid, after a suitable amount of action this constituent retains its original surface and polish, whereas the other two are so much dissolved that it stands up in sufficient relief to allow of the block being used for surface printing instead of a wood cut, so as to exhibit the structure of different varieties of steel, and such is Mr. Sorby's ingenious process. Printed illustrations of the process were exhibited by Mr. Sorby at the conversazione which lately took place at Sheffield, under the auspices of the Leeds Literary and Philosophical Society. These consisted of a "square bar of iron once converted, transverse section, showing iron remaining in the centre;" a "flat bar of iron, slightly converted, the crystals being small;" a "square bar of iron, twice converted, transverse section, showing the centre incompletely converted;" a "flat bar of iron, highly converted, the crystals being rather large;" a "round bar of 'homogeneous metal,' converted, transverse section;" and a "flat bar of hammered cast steel, re-converted, the crystals very large." Mr. Sorby has sent specimens to the Society of Arts.

Commerce.

The Silk Trade in France.—"The silk trade," says the *Courrier de Saint-Etienne*, "appears to be now undergoing a general crisis, the end of which it is difficult to foresee. The American conflict was almost sufficient to shake confidence at Lyons, and the events in Germany have increased the disaster. Unfavourable advices are being received from the neighbourhood of Aubenas, and a large number of silk-dressers have determined to close their mills, in consequence of the impossibility of striving any longer against a disastrous situation. The statement of the general trade in silk for the year 1863 gives a total of 5,647,750 pounds against 6,098,148 pounds in 1862. The effects of this situation are naturally felt at Saint-Etienne. Our ribbon manufacturers are indeed producing a few plain and fancy articles, but orders are scarce. As to velvets, they are passing through a crisis which prejudices our interests in a serious manner."

The Geneva Watchmaking Trade.—The *Builder* says that this trade has been much disturbed of late years, and is still depressed. The number of watches made at Geneva has always been over-stated; many of the watches made at Neuchâtel and other parts of Switzerland, where are produced enormous numbers, being attributed to Geneva. In 1858 political events paralysed the trade. In 1851, the Great Exhibition year, it revived, and it is calculated that about 65,000 watches were made in the twelve months—a number which may be taken as the annual average of Geneva's best time. In 1860 the number turned out was about 40,000, and in 1861, 10,000 less. There is a law in Geneva which prevents the sale of a watch whereof the gold is not of a certain high degree of purity, and this of course gives an advantage to the less scrupulous makers in other parts of Switzerland in markets where inferiority is not discovered; but it is thought that in the end the guarantee which the law in question thus affords the purchaser of a genuine Geneva watch, will bring back buyers and restore prosperity to the trade.

Surat Cotton.—Messrs. H. Clason & Co.'s Market Report, dated Bombay, 12th January, says:—"The prospects continue highly favourable, and most estimates of the shipments from the ports of India for 1864 are 1,600,000 bales. The crop of 1862, which was shipped in 1863, did not exceed that of the previous year, because of the entire failure of the crops in several districts, and the additional soil put under cotton cultivation only just sufficed to make up for the deficiency thereby created. However, it is not to the old cotton district that we have to look for largely increased supplies—their powers of production have already been pretty well taxed—but to new lands, or such parts as have hitherto grown other crops. Amongst the latter the district of Sind is likely to take a prominent rank. The crop in this district is generally put down at about 300,000 bales, which is more than double the previous year's yield. Although bright and clean, there is, however, no improvement whatever in the real value of the cotton, the staple remaining so short and curly that it must be next to impossible for mill-owners to use it. This kind of cotton not being appreciated in Europe, there is only a small proportion of it shipped direct; it is mostly purchased at Kurrachee by the natives, and sent to Bombay, and here large quantities of it are employed for mixing with better descriptions of cotton, thereby reducing the price of the latter. This short-sighted and fraudulent practice is carried on openly and by many native merchants, who are considered first among their class, and it cannot but react unfavourably on the trade of Bombay."

Colonies.

The Revenue of New South Wales, for the quarter ending 30th September, 1863 was £397,923 13s. 9d., showing a decrease of £33,719 19s. 10d. as compared with the corresponding quarter in 1862.

Queensland Cotton.—The *Young Australian*, which sailed from Brisbane on the 15th December, had on board 57 bales of clean cotton, weighing 17,100 lbs.

Limestone in Queensland.—It is said that a very valuable limestone quarry has been opened near the river bank, three or four miles above Rockhampton, possessing all the properties of the lias limestone found at Cardiff. It is also reported that marble of a very superior description is known to exist in the same locality.

Exports from South Australia.—The exports of colonial produce, for the quarter ending 30th September, are valued at £299,016. The chief items are breadstuffs and copper, the wool shipments of the season not being included in the September returns.

Western Australia.—The news from Nicol Bay and the De Grey are satisfactory. A correspondent from the De Grey states that he can immediately find pasture for 20,000 sheep within a radius of 20 miles from his station, and so rapid is the growth of grass, that in five days the spring of feed from freshly burnt ground was sufficient to afford his sheep a bite. Specimens of hay made from the natural grass have been pronounced excellent, and there is no doubt that if brought to Freemantle it would sell at a profit above the cost, labour, and freight. The spinifix grass which was lately considered all but useless, is preferred by the sheep of Mr. Harding to the other grasses, especially the young spinifix springing from burnt ground. The Aborigines have continued friendly, but the guns of the party and their watch-dogs seem to have a material influence upon the native mind. Mr. Taylor, on his return to Perth, reports that he had proceeded up the De Grey to within a few miles of the Oakover. There was plenty of feed and water, but no high land fitted for a station.

Supply of Labour in Western Australia.—A Perth paper says:—"By the arrival of the *Tartar*, after a passage of 107 days, we have received a welcome addition of free labour, and especially of domestic servants. That vessel brought 129 Government immigrants, including 33 single women, but labour is still wanted for public works. The road at the foot of Mount Eliza, or Bazaar-terrace, having been partially formed, appears to have been abandoned, and all the available labour employed upon an imperial work, the Pensioner Barrack. A large party is now employed making bricks for that structure, and how long it will be before labour will be available for colonial works it is difficult to say."

The Glenelg Settlement.—The time of departure of the Victoria pioneers has been postponed until April, but Sir George Grey, the original explorer of this district, has expressed his belief that, independent of its undoubted character in other respects, it possesses mineral resources of value. He enumerates gold, copper, and lead.

The Gold Fields, New South Wales.—In the southern districts the success of the miners has not been very encouraging. The Kiandra diggings now exist only in name; the severity of last winter drove away many of the miners; local jealousies and official mismanagement have finished the work of depopulation. In the western and northern districts the miners have met with varying success; on the whole the yield of gold has been a full average. The Old Ophir diggings have been again brought into note by some very good finds. In one claim twenty-five ounces of gold were washed from a bucketful of dirt from the gutter. At Hargreaves some new reefs have been opened; from a block of stone thirty-six ounces of gold were picked. The quantity of gold dust delivered by the escorts during the month of September last from the several gold-fields has amounted to 33,288 ounces; in September, 1862, the receipts reached 44,803 ounces. For the first nine months of 1862 the quantity was 483,313 ounces; during the same period of 1863 the receipts have been only 327,209 ounces, which is a decrease of 33 per cent. The falling off may be traced to the small amount now received from the Lachlan and Burrangong fields, but from some of the minor gold-fields there is a steady increase.

Finance in New South Wales.—The Colonial Treasurer, in his recent financial statement, estimated the deficit at the end of last year at £534,539, which, however, might be reduced £100,000 from savings. The proposed expenditure for the service of the year 1864 amounted as per estimate to £1,926,457, and the amount of expenditure to be covered by loan was £451,127; total £2,912,123. On the credit side the estimated revenue for 1864 was £1,556,130, and the amount to be raised by loan was £451,127, leaving a balance deficiency at the end of the year 1864 of £904,866 8s. 6d. His scheme of taxation to meet this large deficiency was as follows:—first, stamp duties, estimated at £55,000; secondly, an equalisation of duty on spirits to 10s. per gallon, which would bring in £60,000, and an increase on the duty on wine to 3s. per gallon, £20,000. He also proposed *ad valorem* duties ranging from 5 to 10 per cent. on all articles except the following:—animals (living), passengers' baggage, printed books, coin and bullion, cotton (raw), flax, hemp and fibre, flour, meal, and bread, gold in its natural state, grain of all kinds, guano and manures, hides and skins, dried and salted military and naval stores, ores (unsmelted), plants, trees and shrub roots (esculent), salt, specimens of natural history, tallow, and wool. This scheme of taxation caused much opposition in the mercantile and trading community, but after some articles had been added to the free list, and others reduced from 10 to 5 per cent., the premier (Mr. Martin) subsequently announced the intention of the government to abandon the *ad valorem* duties, and in their place specified rates on particular articles have been proposed, the duties to be levied upon some articles by weight, and upon others by a charge upon packages. The amended tariff is said to be almost as much objected to as the first, as in some instances the duties are heavier and they operate very unfairly. The equalisation of the spirit duties is also thought likely to encourage illicit distillation.

Obituary.

C. F. Bielefeld was born in February, 1803, and when quite a boy turned his attention to modelling. He was self-taught, and at the age of eighteen he obtained a medal, which was presented to him by the Duke of Sussex, for modelling a bust from life. He continued to follow the art for a short time, but circumstances caused him to enter into commercial life, and he always regretted that he did not follow the profession of a modeller or sculptor. He was the first to introduce papier mâché, as manufactured by him, and applied to architectural decorations, &c. By great perseverance he gradually got together a few patterns, all of his own modelling, and he moulded, cast in metal, and chased with his own hands a large number of valuable metal dies for manufacturing papier mâché for architectural and other decorations. The dies in his possession at the time of his decease amounted to some hundreds, and weighed about fifty tons. They are composed of brass, lead, iron, and mixed metal. He took out several patents for articles connected with architectural and other decorations. His patent slab was used, under the direction of Mr. Sydney Smirke, for the lining of the large dome of the new reading-room of the British Museum. In 1832 he modelled and executed in papier mâché the decorations of the Pantheon in Oxford-street, Grocers' Hall, &c. He died on the 10th of January last.

Publications Issued.

Buckmaster's Elements of Mechanical Physics. (*Chapman and Hall.*)—This little book is intended for instructing an intelligent, but not highly-educated mind in the rudiments of physics, and professes to enumerate, with clearness and simplicity, the primary bases on which to build the knowledge required by a mechanic, in enabling him to pursue his craft. The mathematics of the book are not very high, but the author had evidently no wish to enter deeply into his subject. In teaching artisans, one of the greatest errors would be to complicate a subject, and the one great step to be attained, especially in physics, is to establish a simple outline bearing on those points with which a workman has most to deal. Mr. Buckmaster's work is intended as a guide for such elementary education.

THE STATESMAN'S YEAR-BOOK; a Statistical, Genealogical, and Historical Account of the States and Sovereigns of the Civilised World, for the Year 1864. By Frederick Martin. (*Macmillan and Co.*)—The information about each of the 78 States is divided into a series of heads, which are repeated with regularity in each particular case, and statistics which were previously widely scattered are here brought together and tabulated in a convenient form. The facts concerning reigning sovereigns are arranged in such a manner that the dynastical relations which play so important a part in modern history may be easily seen. Notices of the origin and history of the reigning houses are given, with lists of the successive sovereigns. Under the head of "Constitution and Government" a division appears, in which a sketch is given of the constitutional organisation of the different states, and the prescribed action of the legislative and executive authorities. For every State a list is given of the chief officers in the executive departments, including the presidents and vice-presidents of Republics. The most important features of representative forms of Government are explained. "Church and Education" are treated briefly in the more important States. "Revenue and Expenditure" are fully given. The increase and decrease of the national income and expenditure are exhibited, together with the sources of revenue and the objects for which it is applied; and the origin, growth, and actual state of the public debt of the various countries are appended. Under the head of "Army and Navy," there is an account of the aggressive and defensive powers of the States. Under the head of "Population," are included notices regarding the increase of population, the division of the soil, the occupation of the people, criminal returns, and similar matters; and, under the head of "Trade and Commerce," detailed accounts are furnished of the imports and exports and the shipping of all the States in the world, with particular regard to the commerce of this country. The manufacturing industry of the chief nations is given in its principal outlines, together with their mineral wealth.

MANUAL OF THE METALLOIDS. By James Apjohn, M.D., F.R.S., Professor of Chemistry in the University of Dublin. With 38 Woodcuts. (*Longman and Co.*) This is the third of a new series of manuals of the Experimental and Natural Sciences, edited by the Rev. J. A. Galbraith, M.A., and the Rev. S. Haughton, M.D. In a preliminary chapter the laws of combination are laid down, and applied to the construction of a table of equivalent numbers. The atomic theory is here brought under discussion, and the hypotheses pointed out through which equivalent numbers may also be viewed as atomic weights. Chemical symbols and notation are next explained, after which the subject of atomic volume is taken up. A succinct account is next given of the doctrine of isomeric and isomorphous bodies, and of the method by which the formula of a compound may be deduced from the results of its analysis. Attention is directed to elective affinity, in connection with which subject the views of Berthollet are considered and explained. The elements which constitute the Metalloid group are then taken up in succession, beginning with oxygen; and here the descriptive portion of the volume commences. Throughout this the method adopted is to begin with an account of the processes by which each element may be insulated, and then to give in detail its leading properties and reactions, together with the economic and other applications of which it may be susceptible. The compounds formed by each element with those which precede it are next examined, and to many of these a considerable development is given in consequence of their being judged interesting to such as are engaged in some branch of manufacture, or in the study of medicine or engineering. The volume closes with an account of the analysis of gases by eudiometric combustion.

Notes.

PRIZE HISTORY OF GERMANY.—The quinquennial prize of 1,000 thalers in gold, founded in 1844, for the best work on the history of Germany, has been this year recently awarded to Mons. Haeusser for his history of that country since the death of Frederick the Great.

COFFEE AS A DISINFECTANT.—This berry has long been known as a disinfecting agent, but the two following experiments illustrate a mode of using it not generally adopted:—A quantity of meat was hung up in a room which was kept closed until the state of decomposition of the meat was far advanced. A chafing dish was then put in, and 500 grammes of half-roasted coffee thrown on the fire. In a few minutes the room was disinfected. In another room sulphuretted hydrogen and ammonia were developed, and 90 grammes of coffee destroyed the smell in about half a minute. The best way to effect this fumigation is to pound the coffee in a mortar, and then strew it on a hot iron plate.

ALEXANDRA PARK.—Messrs. Kelk and Lucas, the contractors, are getting on steadily with the removal of the Exhibition building to Alexandra-park, where the works are making satisfactory progress. A cricket-ground is being laid out, and will be ready for play early in June. Two Swiss pavilions are ordered for the players, and another pavilion will be erected close to the Wood-green station with a view to the accommodation of 8,000 or 10,000 people. A gymnasium is also contemplated; but the central attraction of the park will be the new building, to be erected at once. Of this building a chromo-lithograph has been issued by Messrs. Day and Son with the sanction of the company. The building will be 900 feet long and 85 wide; one transept of 430 feet will cut the nave in the middle, and each half will be again bisected by a shorter transept of 320 feet, all the transepts being the same width as the nave. Over the centre of the building will be one of the Exhibition domes, but this will be covered in all round except at the top. Two octagonal cupolas will surmount the junctions of the nave and the shorter transepts. The terraces will be laid out on a most extensive scale. That on the north-western side will measure 1,000 by 160 feet, and under it will be formed a railway station, to which passengers may ultimately be brought from all parts of London. A concert-room, a theatre, a grand orchestral platform, a number of dining and refreshment rooms, picture galleries, reading-rooms, &c., are all contemplated.

FRENCH SCIENTIFIC EXPEDITION TO MEXICO.—The Imperial Government has issued a commission—the members of which include the Ministers of Public Instruction and of Fine Arts; Baron Gros, formerly Minister Plenipotentiary in Mexico; M. Michel Chevalier, Senator; Admiral De la Gravière, who commanded the French naval expedition to Mexico; Messieurs Maury, Milne-Edwards, Quatrefages, Sainte-Claire-Deville, and other members of the Institute of France; Baron Larrey, Physician-in-Chief of the French Army; M. Violet-le-Duc and Cesar Daly, architects—to prepare the organisation of a scientific expedition to Mexico and to follow out its results, and a credit of 200,000 francs is to be opened to meet the costs of the undertaking. The report of the Minister of Public Instruction commences with a reference to the famous cohort of Savans that accompanied Napoleon to Egypt—to the "Institut de Cairo"—the "Description of Egypt"—and to the discoveries of Champollion, who, says the Minister, could neither have conceived nor carried out his interpretation of the hieroglyphics but for the great work just named—to the discoveries and consequent labours of Geoffroy Saint-Hilaire and his companions; and says that the Emperor, inspired by these souvenirs, has willed that what Napoleon I. did for the banks of the Nile should be accomplished in Mexico under the auspices of Napoleon III. The scheme is a grand one, comprehending science in a wide acceptation of the word, and including geography, geology, botany, natural history, anthropology, and archæology, in short all that refers to the history of nature and of man, in the once famous dominions of Montezuma. The duties of the Commission are given as follows:—"To furnish the explorers with necessary instructions, to follow the progress of the expedition, and to prepare, for the learned world, the publication of a work which shall be a worthy monument of such an enterprise." Mexico, as the report says, does not possess the historical interest that hangs around Egypt and the East, but certainly there is no part of the world, at the present day, at once so little known and so full of interest, and the expedition, if conducted with common ability, cannot fail of a rich harvest.

College of Preceptors.—It appears by the report of the Council that the affairs of this Corporation are in a most prosperous and promising condition. Forty-four new members have been elected since June, and the diploma of licentiate has been granted to five gentlemen, and that of associate to three. The pupils' examination has been thrown open to schools in general, and at Christmas 530 pupils were examined. The movement in behalf of scholastic registration is rapidly advancing, and appears to be generally supported. The Council trusts that before long such practical steps may have been taken as will render it possible to submit to the legislature a measure containing provisions identical in the main with those which have already received the sanction of the profession, and which are imperatively required, not less for the protection of the public than for that of competent educators of all classes and denominations. It is worthy of remark that mere membership of the College is not considered by the Council to be any guarantee whatever of attainment, or of ability to instruct, as is stated by the president, the Rev. B. H. Kennedy, D.D.—"It is important that the only titles which imply either examination, or any recognition on the part of the College, of ascertained professional competency, are fellow, licentiate, and associate." The object of admitting persons as members, without compelling them to undergo examination, is to give all *bonâ fide* and respectable educators the opportunity of co-operating with their brethren in the effort to "advance the cause of education, or the interests of the scholastic profession," in accordance with the powers granted to the College by its Royal Charter.

PARLIAMENTARY REPORTS.

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SESSIONAL PRINTED PAPERS.

Par.
Numb.

Delivered during the Vacation, 1863.

Royal Academy Commission—Appendix and Index to Report, &c.
Census of Ireland (1861). Vol IV., Part I. (Area, Population, &c.) (No. IV.) (County of Roscommon).
,, ,, (No. IV.) (County of Sligo, &c.).
,, Vol. I., Part III. (Vital Statistics).
,, Vol. IV., Part I. (Area, Population. &c.) (No. I.) (County and town of Galway).
Colonial Possessions—Reports (North American Colonies) Part II.
Colonial and other Possessions of the United Kingdom—Statistical Tables, Part VIII.
Trade and Navigation of the United Kingdom (1862)—Annual Statement.
British North America (Exploration)—Captain Palliser's Journals, &c., &c.

Session 1862.

307 (B I.) Poor Rates and Pauperism—Return (B).
485. Poor Law Unions—Return.
307 (C I.) Poor Rates and Pauperism—Return (C).
307 (E.) ,, ,, Return (E).
488. Sessional Printed Papers—Numerical List and Index.

Delivered on 5th February, 1864.

Affairs in Japan—Correspondence.

Session 1863.

431 (A VIII.) Poor Rates and Pauperism—Return (A).
Census of England and Wales, Vol. III.—General Report.

Delivered on 6th and 8th February, 1864.

19. Railway and Canal, &c. Bills—General Report of the Board of Trade.
France—Correspondence respecting the proposed Congress to be held at Paris.
Italy—Treaty of Commerce and Navigation.
Tunis—Convention relative to the holding of Real Property by British Subjects.
Ionian Islands—Treaty.
515. Poor Relief (Lancashire, &c.)—Return.

Delivered on 9th February, 1864.

15. Bastard Children—Return.
18. Vaccination—Return.
Greece (Accession of Prince William of Denmark to the Throne)—Treaty.
Poland—Correspondence.
Belgium (Redemption of the Scheldt Toll)—Treaty and Convention.
China (Mr. Lay's Memorandum)—Correspondence.
Education—Revised Code of Regulations.
North America (No. 1) (The "Alabama")—Correspondence.

Delivered on 10th and 11th February, 1864.

7. Sardinian Loan—Account.
24. General Committee of Elections—Mr. Speaker's Warrant.
1. Public Income and Expenditure—Account.
4. Licences (Wine and Beer, &c.)—Return.
5. Greek Loan—Account.
6. Russian Dutch Loan—Account.
26. Police (Counties and Boroughs)—Reports of Inspectors.
1. Bills—Rents (Ireland).
3. ,, Judgments, &c., Law Amendment.
4. ,, Insane Prisoners Act Amendment.
6. ,, Malt for Cattle.
7. ,, Collection of Taxes.
Denmark and Germany (No. 1)—Correspondence respecting the Maintenance of the Integrity of the Danish Monarchy.
Poor Relief (Scotland)—Eighteenth Report of the Board of Supervision.
Metropolitan Railway Schemes (1864)—Board of Trade Report.

Delivered on 12th February, 1864.

17. Chelsea Hospital—Return.
23. East India (Council)—Return.
9. Bills—Chain Cables and Anchors.
10. ,, Sir John Lawrence's Salary.

Session 1863.

528. Property and Income-tax (Special Commissioners)—Returns.

Delivered on 13th and 15th February, 1864.

37. George Victor Townley—Correspondence, &c.
47. Navy Estimates.
5. Bills—Conveyancers, &c. (Ireland).
11. ,, Government Annuities.
Irish Fisheries—Report of the Special Commissioners.
Metropolitan Railways—Colonel Yolland's Report.
37. George Victor Townley—Corrected Pages of Correspondence.

Delivered on 16th February, 1864.

50. Army Estimates.
28. Army Estimates—Explanations, &c.
2. Bills—Landed Property Improvement (Ireland) Act Amendment.
8. ,, Church Rates Commutation.
13. ,, Trespass (Ireland).
14. ,, Appeal in Criminal Cases Act Amendment.
15. ,, Vestry Cess Abolition (Ireland).
16. ,, Bank Acts (Scotland).
18. ,, Tests Abolition (Oxford).

Delivered on 17th February, 1864.

48. Navy (Ships)—Return.
12. Bill—County Courts (Ireland).
Indian Officers' Memorials—Report of the Commission.

Delivered on 18th February, 1864.

19. Railway and Canal, &c., Bills—Board of Trade Reports.
30. Manufacturing Districts Act (1863)—Report by R. Rawlinson. Esq.
55. Railway and Canal Bills Committee—First Report.
61. Penal Servitude—Copy of Correspondence.
19. Bills—Warehousing of British Spirits.
21. ,, Forfeiture of Lands and Goods.
22. ,, Watching of Towns (Ireland).

Delivered on 19th February, 1864.

16. Flogging (Army and Militia)—Return.
21. Flogging (Navy)—Return.
29. Mint—Account.
33. Public Income and Expenditure (1861-62 and 1862-63)—Account.
38. East India (Civil Service)—Regulations.

41. Queen Anne's Bounty—Account.
46. Navy (1862-63)—Statement of Savings and Deficiencies.
62. Committee of Selection—First Report.
19. Railway and Canal, &c., Bills (1. Charing-cross Railway; 2. Charing-cross (Northern) Railway; 3. Charing-cross (Western) Railway; 4. East London Railway; 5. Great Eastern Railway (Junctions); 6. Great Eastern Railway (Metropolitan Station, &c.); 7. Great Northern and Victoria Station Railway; 8. Great Northern Railway (No. 1) (Barnet Branch, &c.); 9. Hampstead, Midland, North Western, and Charing-cross Junction Railway; 10. London and Blackwall Railway; 11. London and North Western Railway (Additional Powers); 12. London and South Western Railway (Additional Powers)—Board of Trade Reports.

Delivered on 20th and 22nd February, 1864.

32. Clerical Subscription—Copy of the Commission.
40. Charitable Funds—Return.
60. Cotton Manufacturing Districts—Reports by H. B. Farnall, Esq.
67. Navy (Steam and Sailing Ships)—Return.
49. Navy (Labour Charts)—Return.

MEETINGS FOR THE ENSUING WEEK.

MON. ...Entomological, 7.
Medical. General Meeting at 7; at 8½, Dr. W. Tilbury Fox, "On the Classification of Skin Diseases."
Asiatic, 3.
Royal Inst. 2. General Monthly Meeting.
R. Academy, 8. Mr. R. Westmacott, R.A., "On Sculpture."
TUES. ...Medical. Anniversary at Willis's Rooms. Oration by Dr. Thudichum at 5. Dinner at 6½.
Civil Engineers, 8. Continued discussion upon Mr. Sopwith's paper, "On the Mont Cenis Tunnel." And, time permitting, Mr. G. H. Phipps, "On the Resistance of Bodies passing through Water."
Med. and Chirurgical, 8½.
Zoological, 9.
Syro-Egyptian, 7½. Dr. John Irwine Whitty, C.E., "The Water Supply of Jerusalem, ancient and modern."
Ethnological, 8. 1. Mr. John Lubbock, "On Ancient British Tumali." 2. Mr. Thos. J. Hutchinson, "On certain Native Tribes of Brazil and Bolivia."
Royal Inst., 3. Prof. Marshall, "On Animal Life."
WED. ...Society of Arts, 8. Mr. Frank Buckland, M,A., "The Science of Fish-hatching."
Geological, 8. 1. Mr. E. Ray Lankester, "On the Discovery of the Scales of *Pteraspis*, with some remarks on the Cephalic Shield of that Fish." Communicated by Prof. T. H. Huxley. 2. Mr. G. E. Roberts, "On some Remains of *Bothriolepis* from the Upper Devonian Sandstones of Elgin." Communicated by Prof. J. Morris. 3. Dr. J. J. Bigsby, "On Missing Sedimentary Formations from Suspension or Removal of Deposits."
Graphic, 8.
Literary Fund, 2. Annual Meeting.
Archæological Assoc., 8½. 1. Mr. Cuming, "On Archers' Badges." 2. Various Exhibitions of Roman, Saxon, and Mediæval Antiquities, by Mr. Taylor, Mr. Irvine, and Mr. Brent." 3. Mr. Planché, "On an Effigy of one of the Markenfield Family in Ripon Cathedral."
THUR. ...Royal, 8½.
Antiquaries, 8.
R. Society Club, 6.
Royal Inst., 3. Prof. Marshall, "On Animal Life."
FRI. ......Astronomical, 8.
Royal Inst., 8. Rev. W. H. Brookfield, "On the Use of Books."
SAT. ......R. Botanic, 3¾.
Royal Inst., 3. Prof. Frankland, "On the Metallic Elements."

Patents.

From Commissioners of Patents Journal, February 26*th.*

GRANTS OF PROVISIONAL PROTECTION.

Additions and multiplications, apparatus for making—243—H. A. Bonneville.
Aerostation, apparatus for facilitating—298—G. Davies.
Agricultural implements—413—R. Hornsby, J. Bonnall, and W. Astbury.
Air, apparatus for inhaling—340—W. Clark.
Armour-plates, fastenings for—411—C. P. Coles.
Atmospheric pressure, propulsion by—310—Sir J. S. Lillie.
Barley, &c., apparatus for screening—344—T. S. Cressey.
Barometers—373—J. Hicks.
Blocks, &c., for printing—294—G. H. Holloway.
Bone, horn, &c., softening or dissolving—403—J. Wadsworth.
Bread, &c., manufacture of—393—S. Darby.
Brewing, &c., mashing process—235—J. Fry.
Cast wheels, manufacture of—328—N. McHaffie.
Cement, &c., manufacture of—339—J. Toussaint.
Coke ovens—338—W. C. Stobart.
Cotton, &c., machinery for combing—365—I. Dimock.
Cotton, flax, &c., apparatus for combing—336—J. Smith.
Cowls for chimnies, &c.—389—G. Bohn.
Crinolines—3078—J. Fleurman.
Cylinders, steam engine—326—T. Snowdon.
Doors, &c., rendering water-tight—285—J. Smith.
Earthenware, &c., saddles for supporting—296—I. Edwards.
Engines, &c., deadening the noise produced by—352—S. Middleton.
Ether, methylic—387—P. A. L. de Fontainemoreau.
Fabrics, looped, &c.—350—W. Carnelly.
Felting, wool and hair—2697—H. B. Barlow.
Fire-arms, &c., construction of—409—J. Aisthorpe.
Fire-arms, breech-loading—3253—W. E. Newton.
Fire arms, breech and muzzle-loading—397—R. St. L. Pigot.
Fire-guards—311—H. Gurney.
Furniture—375—F. W. Burton.
Gaseliers, slide for—300—S. Bark and T. Attwood.
Hinges—312—M. Runkel.
Lace, imitation—279—S. Ferguson, jun.
Liquids, apparatus for measuring, &c.—359—J. H. Johnson.
Locks, &c.—379—J. Redford.
Metals, &c., machines for punching, &c.—383—W. Krutzsch.
Mill straps, &c.—306—J. Lee.
Paints, &c., preparation of—332—J. Webster.
Power, machinery for transmitting—377—T. Smith and T. Lister.
Power, obtaining and transmitting—348—A. V. Newton.
Printing rollers—391—J. Huntingdon.
Pullies, &c.—367—J. W. Wetherell.
Railway rails—369—J. Henderson, S. C. Child, and W. L. Duncan.
Reaping machines, &c.—327—D. Pidgeon and W. Manwaring.
Rooms, &c., warming—342—A. M. Perkins.
Sewing, &c., machinery for—334—V. De Stains and T. Rogers.
Sewing machines—302—M. A. F. Mennons.
Sewing machines—304—J. Cooper.
Ships' cables—3144—R. Saunders.
Stays, &c.—245—S. Dixon and J. Calvert.
Steam, &c., application of, to circular motion—381—G. Finch.
Steam boilers, &c., securing tubes in—347—A. V. Newton.
Steam boilers, &c., vertical—324—J. T. Oakley.
Sulpho-cyanides, manufacture of—346—P. Spence.
Swings, cradles, &c., oscillating motion in—401—J. Deavin, M. Deavin, and J. H. Sutton.
Vessels of war, &c., construction and equipment of—316—A. McLaine.
Water-closet and urinal, combined—385—J. Dence.
Wheels, axles, &c., construction of—237—J. Rogers.
Wheels, breaks for—308—R. A. Brooman.
Windmills—314—T. Eccles.

PATENTS SEALED.

2140. F. C. P. Hoffmann.
2141. W. Welden.
2149. B. L. Burnett.
2153. J. Miles.
2156. J. Snider, jun.
2158. G. Russell.
2160. P. Joyot, jun.
2163. T. Erich.
2164. G. W. Ewens.
2166. J. Lewis.
2167. R. Young.
2186. T. Fisher.
2213. W. H. Tucker.
2252. J. A. Whipple.
2266. G. Lewal.
2779. G. Haseltine.
3007. P. G. Gardiner.
3261. S. S. Gray.

From Commissioners of Patents Journal, February 23*rd.*

PATENTS SEALED.

2170. C. H. Corlett.
2175. A. A. Beaumont.
2182. J. Loebl and I. Pick.
2184. C. G. Kelvey and W. Holland.
2187. W. Lorberg.
2194. R. Batt.
2195. C. H. Adames.
2196. G. B. Rennie.
2204. J. H. Cutler.
2208. T. H. Baker and G. Friend.
2211. J. D. Jack.
2215. W. H. Hawksworth.
2222. W. Clark.
2271. B. Latchford.
2281. A. Chaplin.
2285. J. G. Ulrich.
2290. J. Allen.
2293. G. Davies.
2359. A. V. Newton.
2739. R. Smith.
2800. W. R. Bowditch.
2910. J. Colling and D. G. Pinkney.
2939. D. W. Hamper.
3016. E. A. Inglefield.
3077. C. Brown.
3181. A. V. Newton.
3231. W. L. Winans and T. Winans.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

470. T. Spencer.
516. J. Wilson.
492. W. H. James.
520. W. Rose and T. Crowder.
500. W. Whalley.
506. J. Taylor, junr.
513. W. J. Hay.
518. C. Beslay.
483. L. A. Bigelow.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

547. W. Wood.
568. W. Mills.
632. T. Brown.
571. W. Macfarlane.
596. H. D. P. Cunningham.
597. T. H. Jennens.

Registered Designs.

Rack pulley—4619—Feb. 4—W. Tonks and Sons, Birmingham.
A portable folding whatnot dinner waggon or sideboard—4620—Feb. 18—John Mead, Abridge, Essex.
The Alexander drag—4621—Feb. 27—Jas. Evans, Liverpool.